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American Gas Journal

MAY, 1958 | Only Magazine Edited Exclusively for the Gas Distribution Indu

REYNOLDS

trouble-free
and
accurate

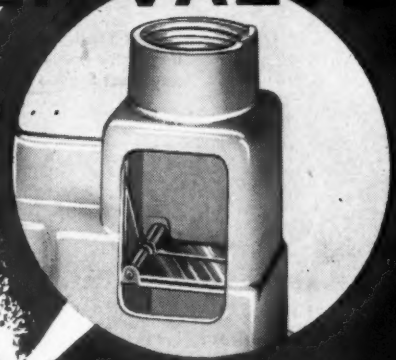
INTERNAL RELIEF VALVE

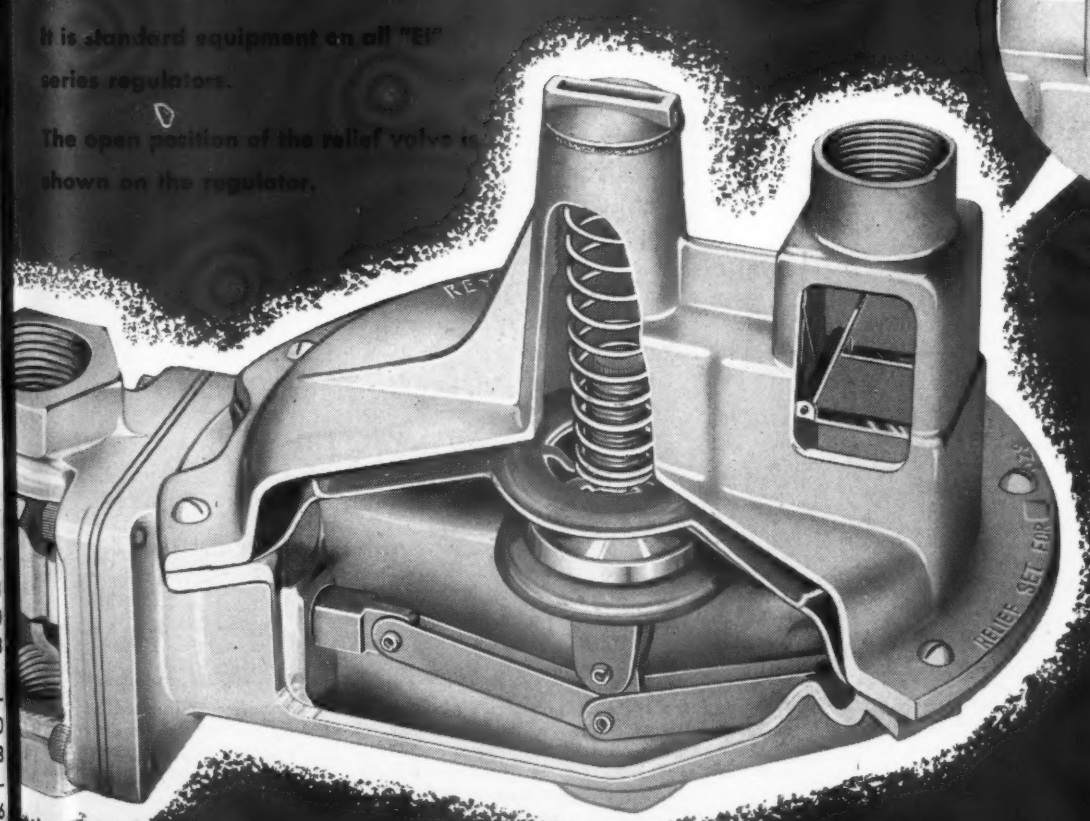
Reynolds new full capacity relief valve is inter-changeable for older model regulators.

It is standard equipment on all "EI" series regulators.

The open position of the relief valve is shown on the regulator.

Closed Position





This new Reynolds re... valve has a double ... sealing effect which ... the use of a large re... valve orifice which still... and relieves within ... regulation.

An Automatic quick ... ing flapper for excess ... sure gas and yet has ... ard small vent opening ... normal regulation.

The all stainless steel ... struction flapper valve ... inates high shock-loss ... common to other type re... lators.

Also available on NRT... series No. 1 Model 10, ... Model 20, and No. 1 Mo... 30 series.

Not Shown—A Complete Line of Outside Vent Pressure

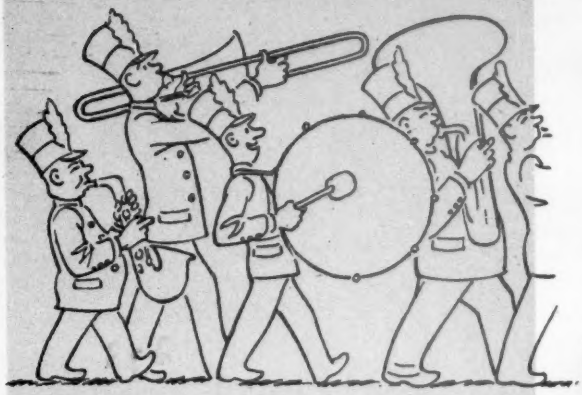
GAS CONTROL SINCE 1892

WRITE FOR DETAILED INFORMATION

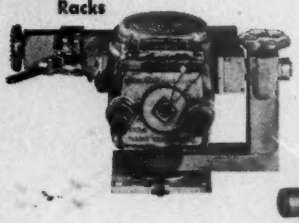
REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana, U. S. A.

WELCOME SGA

to our old home town for your 50th Anniversary CONVENTION



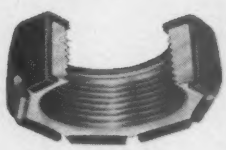
WELCOME TO DALLAS! We're glad that Dallas, our home town, was selected as your 1958 convention city. A cordial invitation to visit the UNIVERSAL plant is extended to every member of the Gas Industry attending the convention. Also, we look forward to seeing each of you at our hospitality suite, Statler Hilton Hotel.



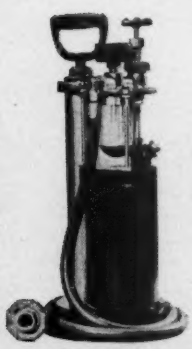
Meter Repair Racks

Gas Service Regulator Repair and Test Stands

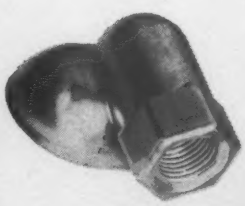
Dielectric or Insulated Pipe Unions



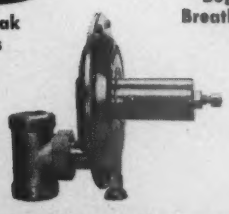
Insulated Meter Nuts



Dragnet Leak Detectors



Weather and Bug Proof Breather Vents



Gas Service Regulators

SEE US AT ANOTHER IMPORTANT GAS MEETING

AGA Distribution Conference, New York City, May 4 to 9, 1958.

Our headquarters, Commodore Hotel.

Universal Controls Corporation's plant and office building is located adjacent to Highway 77 (Hines Boulevard) in Carrollton, only 14 miles from downtown Dallas. The building has 23,000 square feet and is completely air conditioned using power from a 110 H. P. engine *burning natural gas.* Everyone interested is welcome to inspect this installation.

UNIVERSAL CONTROLS CORPORATION

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Established 1859

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ONLY MAGAZINE EDITED EXCLUSIVELY FOR THE GAS DISTRIBUTION INDUSTRY

May, 1958 Vol. 185, No. 5

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The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

Get full details. Send for bulletin 1150.

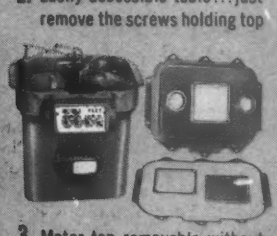
This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

neptune

Look at these advanced design features:

1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top



3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism

8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter

In 250 cfh and 340 cfh sizes to meet most domestic requirements.

ABC

American Gas Journal

Established July 1, 1859

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Printed in U.S.A.

ABP

Fuel for Thought

IF EVERY U. S. INDUSTRY held the optimism exhibited by gas appliance manufacturers at the recent GAMA annual meeting, there wouldn't be any talk of "recession" . . . in fact, the nation would be too busy with a "boom." While much of the U. S. is "singing the blues," the gas industry is optimistic and aggressive. It is developing new appliances, improving old ones, and showing consumers new ways to do more with gas. Much of the credit for the recent swift progress in the gas industry is due the appliance and equipment manufacturers. Much credit is due, too, to continuing improvement of "unity" among all segments of the gas industry.

Speakers at the GAMA meeting in White Sulphur Springs emphasized this point. For example:

R. W. Otto, AGA president, said manufacturers deserve special praise. They are developing product improvements more rapidly than at any time since the starting days of the industry.

Clifford V. Coons, president of GAMA, noted that "everybody is talking about recession . . . let's not add to the customer confusion. Let's stay too busy educating the consumer . . ."

Chet Stackpole, AGA managing director, emphasized, ". . . there is only one thing to do. Advertise, promote, and sell harder and smarter than ever before. Spend more time, more effort, and more money than ever before, for sales and service training of dealers, distributors, and utility folks alike. And finally . . . go out and sell, so that more orders will be forthcoming."

W. M. Jacobs, chairman of the AGA Gas Industry Development Committee, pointed out that "bigger and more profitable sales volume . . . is impossible without teamwork between manufacturers and utilities; between AGA and GAMA."

A MARKET POTENTIAL of 57,000,000 new residential gas appliance and equipment items exists in the next five years — not counting air conditioning and refrigeration — noted Stackpole, citing figures from a recent AGA survey.

"If our industry is to reach these goals," he added, "it must point its experience toward greater product improvement, broader sales promotion efforts, more intense sales and service training, and spread the gospel of 'every man and woman, including wives, who is a part of us, a salesman for gas, gas appliances, and the gas industry,' This could mean a sales force of over a half million people!"

CITED AT THE MEETING were examples of new developments that can materially benefit both the gas appliance and equipment manufacturers and the overall gas industry. They include:

. . . a remarkable electronic scheme for continuous checking of the safety equipment for large gas installations.

. . . a brand-new concept of burning gas, employing platinum catalysts in equipment similar in external appearance to resistors on electric ranges.

. . . advances in application of automatic top burner heat controls in gas ranges, and special features such as remote control, infra-red broilers, and keyboard-type control panels.

. . . a trend toward non-ferrous tanks and engineering developments that will assure faster recovery for adequate supplies of hot water.

. . . the smokeless-odorless gas incinerator, which operates on a unique principle of consuming its own waste products through combustion — and the perfection of an outdoor model of this incinerator.

In addition to product developments, another news item highlights the industry's picture: Formation of a true gas refrigerator industry, with several producers. This, in itself, corrects one major past weakness — a single company industry.

ONLY A STRONG INDUSTRY, with all segments working for a common goal, could produce such evidence of unity and progress.

— *The Editors*

AMERICAN GAS JOURNAL, May 1958, Vol. 185, No. 5. Published monthly (except September, then semi-monthly) by The Petroleum Engineer Publishing Company, P. O. Box 1589, Dallas 21, Texas. Second class mail privileges authorized at Dallas, Texas. Executive and Editorial Offices at 800 Davis Building, P. O. Box 1589, Dallas 21, Texas.

Look...a complete farm t

Type S-102-4 service regulator for settings 3½" to 15" W.C.
Type 1805 relief valve available for settings from 5 to 125 PSI.
Type 622 farm tap regulator for first stage pressure reduction will handle inlet pressures up to 750 PSI. Supplied with shut-off valve in body. Can also be supplied with regulator for pressures up to 1500 PSI.

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD... CHANCES ARE IT'S CONTROLLED BY..

tap that's ready to hook up!

It's piped up. Now you have a complete assembly of the first stage regulator, relief valve and service regulator bucked-up complete with piping, ready to install. No more searching for individual items. No more building of the farm tap hook-up on the job.

It's pressure-tested. Fisher tests and sets the farm tap assembly at the factory.

It's completely packaged. The farm tap assembly comes in a sturdy carton assembled to your specifications. Cuts down the number of individual cartons and boxes it was previously necessary to haul around with you.

Think of the savings in time and manpower

Fisher has done much of the farm tap installation work for you. Fisher has cut out the wasted time looking for individual regulators—the cutting and threading of pipe to size—the assembly of the individual items. The packaged unit is available in a wide range of assemblies to meet your pressure or piping requirements. Fisher will tailor-make a farm tap assembly for your individual conditions.

It's another Fisher first. A complete farm tap that's ready to hook up.

Write for bulletin numbers P11A and S100 which illustrate and describe Fisher Farm Tap Equipment.

FISHER® Controls

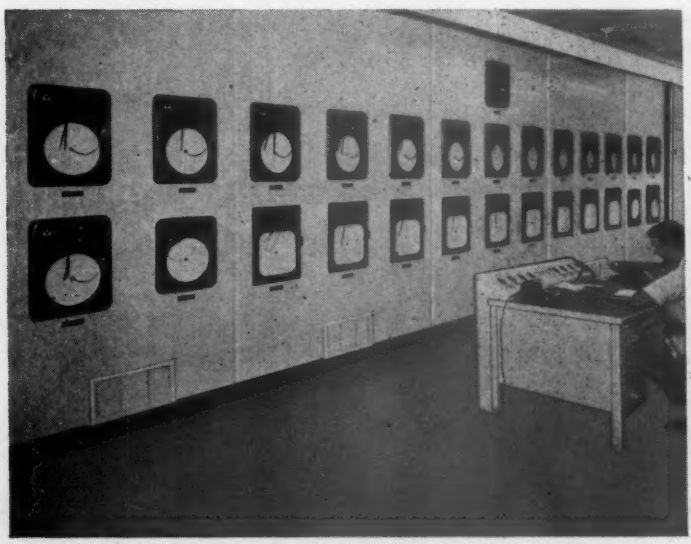
SINCE 1880

FISHER GOVERNOR COMPANY

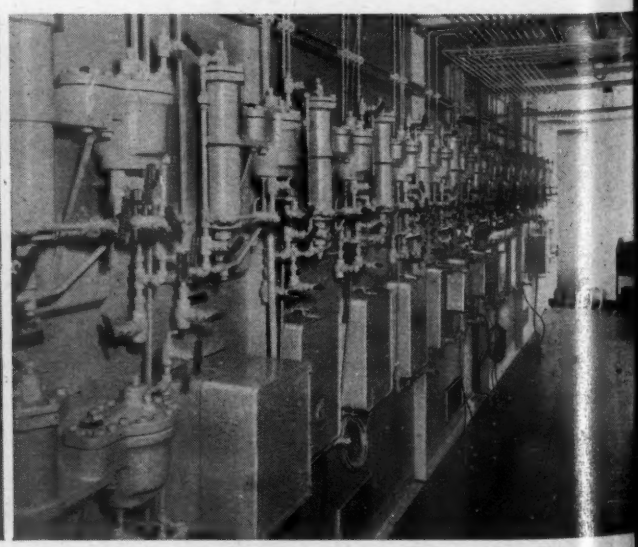
Marshalltown, Iowa/Woodstock, Ontario/London, England

Topock... where

Fifteen 16" Meter Runs are at Topock. Gas transmitted through this installation goes to Pacific Gas and Electric Company, Southern Counties Gas Company, Southern California Gas Company and Nevada Natural Gas Company.

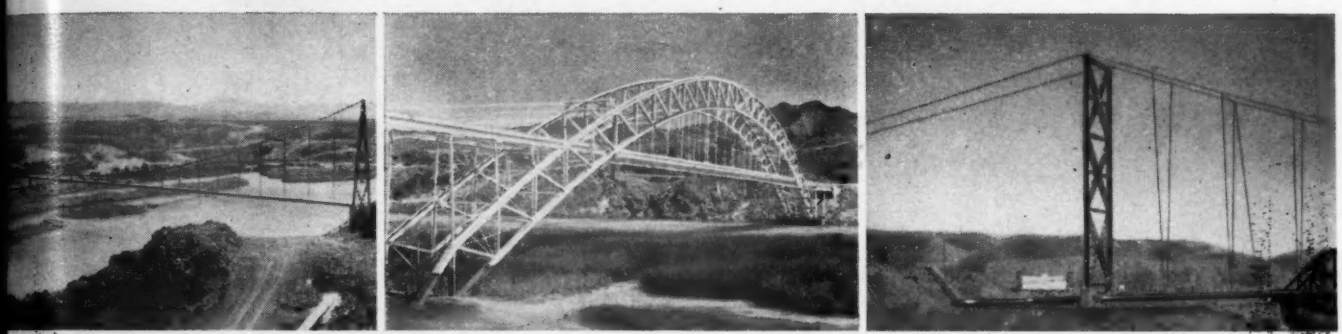


Instantly Available to dispatchers at all times, are readings from the American Orifice Meters on the panel board. Charts are changed daily and mailed to a central point for integrating and billing.

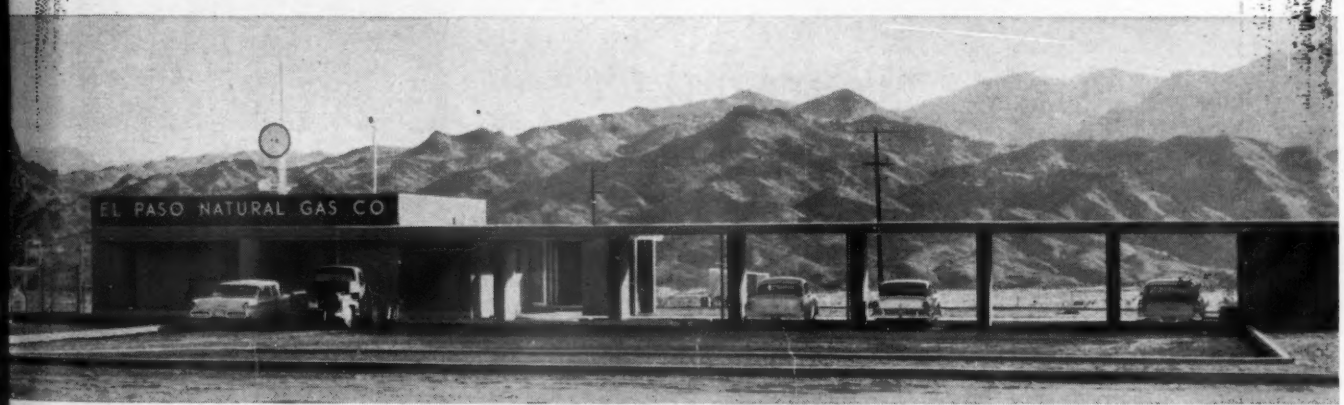


American Orifice Meters on back of panel board are A-20's. 100 inch range mercury manometers are designed for operation up to 1800 psi working pressure.

American® meters measure nearly 1½ billion cu. ft. of gas per day



Topock Means Bridge in Indian language. These three 1,000 foot bridges carry two 30″ and one 34″ pipe line across the Colorado River for transmission to California. The natural gas in each aerial line weighs about six tons.



At Topock, Arizona, on the banks of the Colorado River, almost one and one-half billion cubic feet of natural gas a day, piped across the desert from New Mexico, Colorado and Texas, are mixed to supply the uniform BTU natural gas for the growing needs of California and Nevada. Metering and control is effected at this ultra-modern air-conditioned desert station. Because of the immense volume of gas measured at this point, minute errors could result in losses amounting to hundreds of dollars a day.

Here, fifteen American Orifice Meters, each capable of measuring and recording 100 million cubic feet of gas a day at 500 psi, provide the sustained accuracy required, for measuring the largest volume of gas flowing through any metering station today.

American Meter engineering assistance, and American precision equipment are available for every measurement and control problem. *Call* or *write* your nearest American Meter Company representative.

AMERICAN METER CO.

AMERICAN® METER COMPANY

INCORPORATED ESTABLISHED 1836

GENERAL SALES OFFICE: Philadelphia 16, Pennsylvania
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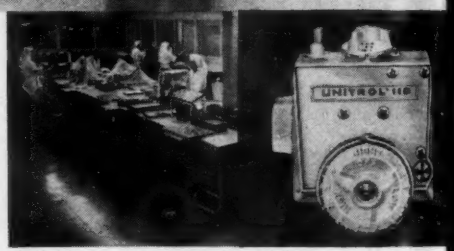
SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

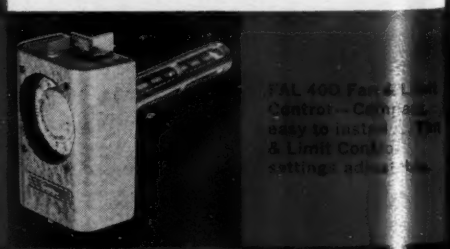
From its modern $10,000,000.00 plant in Long Beach...

Robertshaw enters the manufacture of **Central Heating Controls!**



* **Exacting Quality Control**—a proved factor in the successful development and production of millions of dependable water and space heater controls.

Unitrol 110—the standard of the water heater industry... more than 3,000,000 controls produced and sold with less than one-half of one percent returns.



* **Exacting Quality Control**—now lends its technique to the manufacture of Central Heating Controls and Accessories!

Dependable Robertshaw controls are advertised nationally to your customers in Good Housekeeping, American Home, Sunset and Saturday Evening Post.

CONTACT:

Robertshaw-Fulton CONTROLS COMPANY

GRAYSON CONTROLS DIVISION, LONG BEACH, CALIFORNIA

- Direct-reading feed and position indicators!
- Full-time position indicator shows boring bar position at all times!
- Easily-set feed indicator automatically shows depth of cut!
- Feed automatically disengages to prevent overtravel of boring bar when travel limit is reached!
- Cuts from 2" through 6".

Now! automatic cuts under pressure up to 1440 p.s.i. with the

NEW MUELLER® CH-6

Machine!

New design and new features give automatic operation for faster, safer cuts; more strength for reduced maintenance; simplified operation for use by inexperienced personnel; more compact for easier handling; and standardized tools for simpler tool selection.

NO-BLO

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

FORM NO. G-8884

Printed in U.S.

NEW *self-adjusting boring bar packing*

High temperature chevron packing is spring-loaded to insure positive, leakproof sealing without packing adjustments. Line pressure does not enter case.

NEW *power or hand operation*

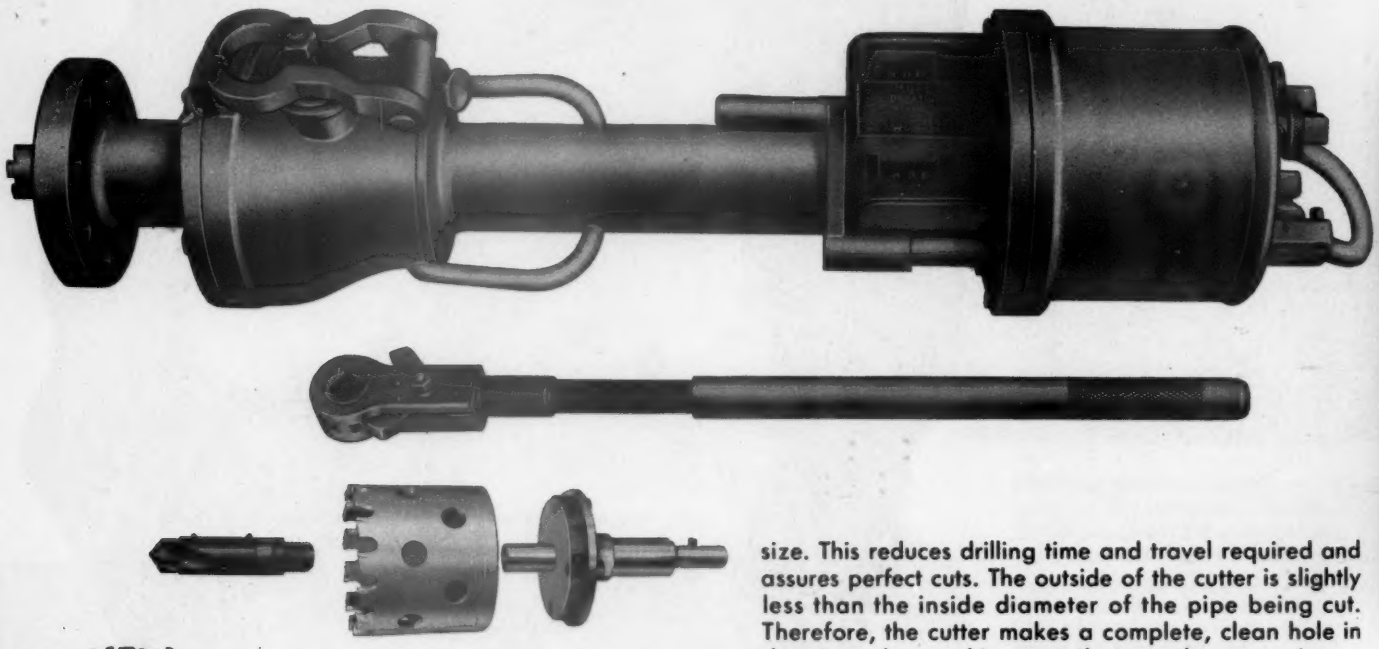
May be hand operated with ratchet handle or power operated with Mueller H-601 Air Motor or Mueller H-602 Gasoline Engine Drive Unit. No changes are required in the machine to use hand or power operation.

NEW *rugged all-steel construction*

All working parts are totally enclosed in a galvanized steel case to permit complete lubrication and to prevent damage from dirt or other foreign matter and from rough handling. Lubricant is sealed in with "O" rings. Large bearing surfaces assure boring bar rigidity.

NEW *handling ease*

Telescopic design reduces over-all length and weight. Conveniently placed handles and lifting yokes permit easy handling of machine—manually or with hoisting equipment. Front lifting yoke may also be used to lock the boring bar while attaching or removing tools.



NEW *standardized tools*

Tungsten carbide tipped shell cutters are designed for cutting any type pipe. Tool selection and inventory are greatly reduced. Each shell cutter used for lateral connections is specifically designed ½" under the nominal size. This reduces drilling time and travel required and assures perfect cuts. The outside of the cutter is slightly less than the inside diameter of the pipe being cut. Therefore, the cutter makes a complete, clean hole in the pipe when making cuts that are the same size as the pipe. Cutter arbors for the larger shell cutters are of the "E-Z-Release" type. All pilot drills screw into the cutter arbor to give greater rigidity and perfect centering. Pilot drill contains a mechanical coupon retaining device. The cutter, arbor, pilot drill and coupon can be removed as a unit without first removing coupon.

NEW CH-6 FEATURES

. . . designed to reduce your cutting time!

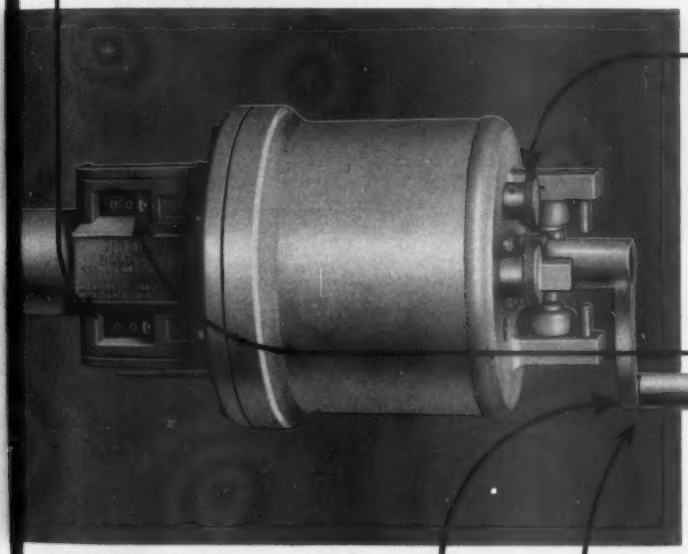
Now! a new, automatic, high pressure drilling machine for 2" through 6" cuts under pressure in any type of pipe.

NEW *automatic tool position indicator*

Direct-reading indicator shows—at all times—the position of the pilot drill and shell cutter in relation to their fully-retracted or rearmost position. Large numerals read in inches and tenths of an inch and automatically add as the tool is advanced and subtract as the tool is retracted. Eliminates tool position guesswork.

NEW *automatic overtravel protection*

Tool feed is automatically disengaged when the maximum 24" travel of the machine is reached. Damage to the machine is prevented—even when the automatic feed has been set for travel beyond the maximum travel of the machine.



NEW *automatic feed-setting*

The amount of travel required in automatic feed can be quickly and accurately set in inches and tenths of an inch. This amount is clearly shown on the automatic feed travel indicator to insure accurate settings every time.

NEW *automatic feed travel indicator*

As the cut progresses, the direct reading indicator automatically subtracts—always showing the amount of travel remaining in automatic feed. You always know just how much of the cut remains to be made.

NEW *two-speed rapid hand travel*

When not cutting, the boring bar may be quickly and easily advanced or retracted by hand. The direct rapid travel shaft is used when working with normal pressures. The geared shaft is used when working with high pressures. Rapid advancement and retraction of the boring bar reduces time of operation.

NEW *automatic feed disengagement*

When the preset travel in automatic feed is completed and the indicator reads zero, the tool feed is automatically disengaged to prevent damage and loss of time.

Check with your Mueller Representative for complete details.

MUELLER CO. DECATUR, ILL.

specifications

MUELLER CH-6 *drilling machine*

Capacity and Use

The CH-6 Machine makes cuts from 2" through 6" inclusive in any type of pipe. It is used with tapping sleeves and valves, standard gate valves, extension stoppers and flanged tees to make lateral connections up to 6"; line stopper fittings to make cuts into pipe up to 6" prior to stopping-off lines; and with Save-A-Valve drilling nipples to make temporary or semi-permanent connections up to 6". All cuts are made under pressure.

Working Pressure and Temperature

1440 p.s.i. at 100° F.
500° F. at 1250 p.s.i.

CH-6 Machine and Equipment Furnished

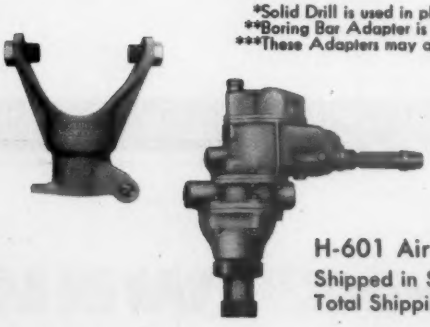
Shipped in Strong Wooden Chest
Total Shipping Weight: 328 Pounds.
Approximate Weight of Machine: 213 Pounds.

Equipment to be Selected

Power Operating Units, cutting equipment (cutter, pilot and hub) and Adapters.

	For Line Stopper Fittings			For Mechanical Joint Tapping Valves and Standard Gate Valves			
Size of Fitting or Valve	3"	4"	6"	2"	3"	4"	6"
Size of Shell Cutter or Drill	3⅛"	4⅛"	6⅛"	1¾"	2½"	3½"	5½"
Shell Cutter or Drill	49043	49044	83647	48271*	83617	83203	83134
Cutter Arbor	83637	83644	83648	83632**	83635	83637	83640
Pilot Drill	83634	83643	83639	.....	83634	83634	83639
Adapter for Line Stopper Fittings	83630	83630	83631	.....	.....	.....	.....
Adapter for Tapping Valves	.....	.....	.....	83658	83660	83662	83664
Adapters For Standard Gate Valves:							
150 Pound Flange	.....	.....	.....	83619	83621	83623	83626
400 Pound Flange***	.....	.....	.....	83620	83622	83624	83627
600 Pound Flange	.....	.....	.....	83620	83622	83625	83628

*Solid Drill is used in place of shell cutter for 2" size.
**Boring Bar Adapter is used with Solid Drill.
***These Adapters may also be used with valves having 300 pound flanges.



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SIE Telemetering Systems bring automatic pipelining ANOTHER STEP NEARER

With the development of the TTR Telemetering System, SIE moves another major step forward toward the fully automatic pipe line.

TTR Telemetering Transceivers are the newest addition to the SIEMARC (SIE Monitoring and Remote Control) system. By receiving measurement data and trouble signals from remote units and returning necessary command signals, the TTR provides the vital automatic link between compressor stations and the dispatching office.

An unlimited number of functions may be carried on a single voice frequency channel. Unique modulation methods and coding techniques minimize random errors and make possible the use of low cost, readily available transmission facilities. Solid state circuitry and straightforward design assure system reliability and long service life.

Combined with SIE Compressor Start Units, Telemetering Transceivers allow immediate interrogation of remote functions and automatic verification of performance, and provide the dispatcher with continuous centralized monitoring and control.

If you are contemplating new pipe line construction or modernization of existing lines, *plan ahead toward the fully automatic pipe line* by installing these basic units now. Contact the SIE Control Division for full information.

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With the Odorometer, the odor characteristics of a gas stream can be determined at any convenient point on the gas distribution or transmission lines. It is both a more accurate and a much faster method of determining odor levels than the previously used "room-test" method. By making periodic checks with the Odorometer, gas utilities are maintaining odorant intensities at a safe and constant level.

For complete information on the Oronite Odorometer — facts about its construction and principles, operating instructions — contact the Oronite office nearest you. Or, ask for a demonstration of the Odorometer on your system.

Oronite Gas Odorant Products

Calodorant® C — completely stable cyclic sulfide-type odorant
Calodorant® C Special — blend of Calodorant C and solvent
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REPUBLIC NATIONAL BANK BUILDING • POST OFFICE BOX 718 • DALLAS 21, TEXAS

Tomorrow's Progress Planned Today

Heat pumps aren't so hot, Florida residents found during the recent cold snap that chilled the oranges before they could be made into juice. In St. Petersburg, county school board members were told by their assistant school superintendent that electric heat pumps installed in 10 of the county's schools, began breaking down with clocklike regularity. Crews rushed from school to school to keep students warm and ended up installing gas-fired boilers to heat classrooms. The board approved a proposed survey to find out why the electrically operated devices broke down.

Diversification deluxe. Tennessee Gas Transmission Company, which operates the longest and one of the largest gas pipeline systems in the nation, has acquired 93.4 percent of the common stock of Grand Central Rocket Company of Redlands, California. Present personnel of GCR will continue in office. An expansion of the firm's operations will be initiated in the near future. The firm produces propellants and solid fuels for use in missiles and rockets. Addition of Grand Central to the TGT stable gives the Houston-based firm wide diversification, including oil and gas exploration and production; extraction, conversion and marketing of natural gas hydrocarbons; petroleum refining and product marketing; petrochemicals; life insurance and a commercial parking garage.

Ohio Valley Gas Company, newly organized subsidiary of Columbia Gas System, has applied to the FPC and the Ohio PUC for permission to take over service of natural gas to 45,000 customers in 24 eastern Ohio cities, which are now served by Manufacturers Light and Heat Company of Pittsburgh, Pennsylvania. The move is another step in Columbia's corporate simplification program. Ohio Valley has already received PUC approval of an application to take over service of 13 communities in southeastern Ohio now served by United Fuel Gas Company of Charleston, West Virginia, another Columbia subsidiary. Applications for this change are before the FPC and SEC. Management personnel of Ohio Valley are the same as Ohio Fuel Gas Company, also in Columbus and a Columbia Gas System subsidiary.

Transcontinental Gas Pipe Line Corporation, major supplier to the New York-New Jersey-Philadelphia area, is looking ahead. While other big transmission companies are holding off on construction and system expansion pending Supreme Court action on the Memphis Case, Transco is going ahead with plans for new facilities — including a third underwater crossing into New York City, lines to tap offshore gas reserves in South Louisiana, and new compressor stations and main line additions to complete the looping of its Texas-New York system. Transco has obtained letters of "consent" from its contract demand customers permitting it to file for an increase in rates effective not earlier than November 1, 1959 — Memphis case reversed or not.

Future construction contracts in the U. S. for February totaled $1,953,422,000, a 10 percent decrease from February, 1957. This marked the second consecutive month in which contracts registered a 10 percent decline, reports F. W. Dodge Corporation, construction news and marketing specialists. Residential building construction was down 17 percent, with 1 and 2-family units down sharply but apartment units up two percent. Dwelling units of all types totaled 59,172.

Home builders are going to get more attention from gas appliance and equipment manufacturers. Efforts in that direction was one of main marketing themes at recent GAMA annual meeting in White Sulphur Springs, West Virginia. Many gas utilities and the AGA are already at work in this area . . . an area that only a short time ago wasn't favored with too much selling from the gas industry. Inroads made by electric industry have been, to a large degree, in the building end . . . the gas industry belatedly has recognized. But the big push apparently is on its way to make the homebuilders conscious of gas appliances of all types.

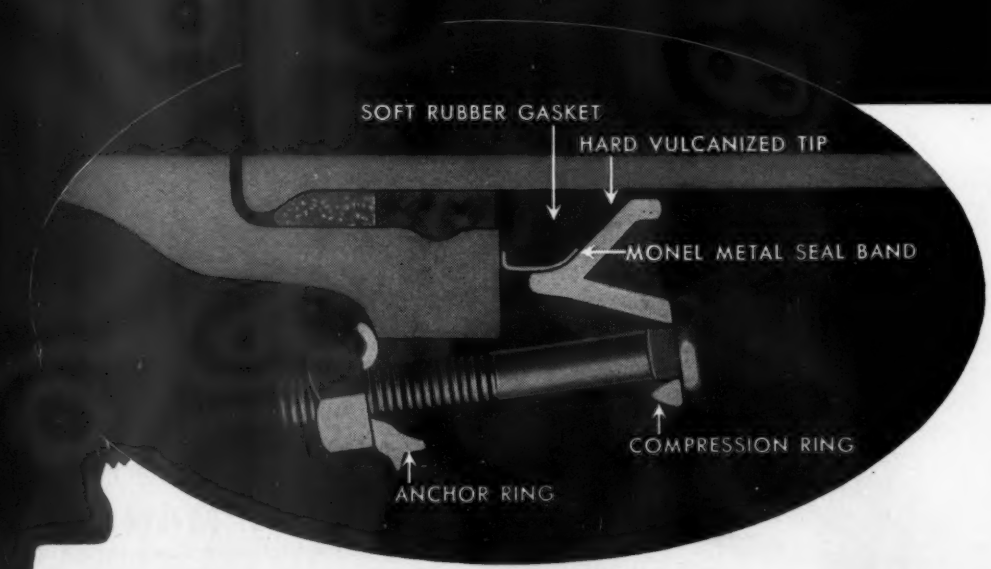
Proponents of public-owned utilities (particularly public power) are exercising their influence in Washington to shut off institutional advertising of privately-owned utilities under the guise that it is "exploitation of propaganda," to quote from an Internal Revenue Service ruling. The IRS recently ruled that contributions by independent power and light companies to the Electric Companies Advertising Program (which promotes free enterprise) would be disallowed on tax returns as a "business expense." This, coupled with bills introduced recently by Rep. Johnson of Wisconsin (HR 9664) and Sen. Langer of North Dakota (S 3074), portends a serious trend towards licensing the free speech of all public utilities — **including gas.** It puts the privately-owned utilities in the unfair position of having to defend themselves against **tax-free** public-owned utilities promoted by politicians who would not be equally restricted.

Regulatory notes. In an effort to reduce its work load and eliminate unnecessary full-scale hearings on minor projects, the FPC is granting "budget-type" construction certificates to gas companies under its jurisdiction. Examples of this are found in a certificate granted Arkansas Louisiana Gas Company to construct new facilities to connect new supplies of individual projects to a maximum of $500,000, with a total cost not to exceed $2,260,000 for the year of 1958. . . . A bill to permit counties to levy a 5 percent tax on utility bills has been introduced in the Virginia legislature. It would apply to utility bills in any county applying the levy. . . . Penalties up to a $1000 fine and a year in jail are provided in a new ordinance adopted by the city council of *Columbus Ohio,* for using a gas range to help heat a house. The law is a weapon to combat a rising number of carbon monoxide deaths. . . . Cheyenne Light, Fuel and Power Company has been authorized by the *Wyoming* PSC to increase its gas rates by about $52,223 annually. . . . Rate increases amounting to approximately $3,021,000 annually were authorized in February for Manufacturers Light and Heat Company of Pittsburgh by the *Pennsylvania* PUC—less than half the amount requested by the company in its application filed in March, 1957. . . . *Michigan's* PSC has said it would allow Michigan Consolidated Gas Company an approximately $6,000,000 annual increase; a $15,500,000 hike was asked.

SEALED GASKET

3/4" bolts

massive design



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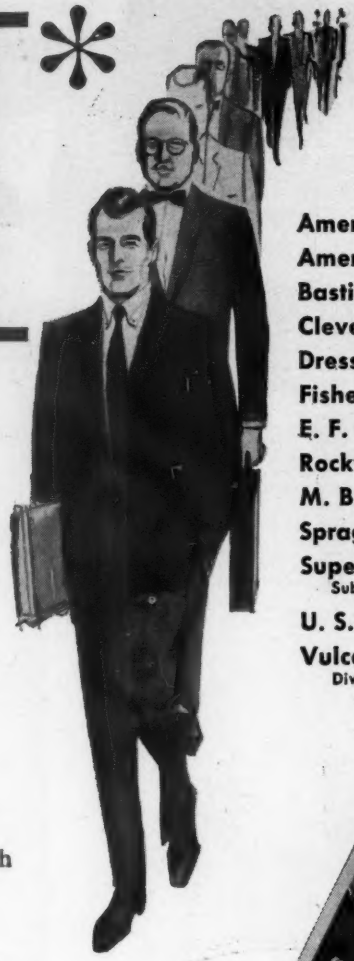
GEM*

promotes Gas Industry Growth



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Promoting the sale of GAS and of GAS appliances and equipment is the responsibility of everyone connected with the GAS Industry – utilities, LP-Gas Marketers, manufacturers and suppliers alike.

Again in 1958, members of GEM – the Gas Equipment Manufacturers Group are underwriting a national advertising program to help increase sales of GAS and of GAS appliances and equipment. These manufacturers are accepting their responsibility – standing up to be counted among those helping the GAS Industry grow and prosper.

All Suppliers to the GAS Industry are invited and urged to join the GEM Program and help insure the future of their business.

FREE reprints of Saturday Evening Post advertisements, for use by Gas Utilities and LP-Gas Marketers are available. GEM price tags, with room for appliance prices and terms can be obtained at $10 per 1000.

As the Gas Industry goes, so will go the business of everyone selling to it.

For full information, ask any GEM Sponsor or write:

***GAS EQUIPMENT MANUFACTURERS GROUP**
c/o Gas Appliance Manufacturers Association
60 East 42nd Street, New York 17, N. Y.

Coming Events

IN THE GAS DISTRIBUTION INDUSTRY

April

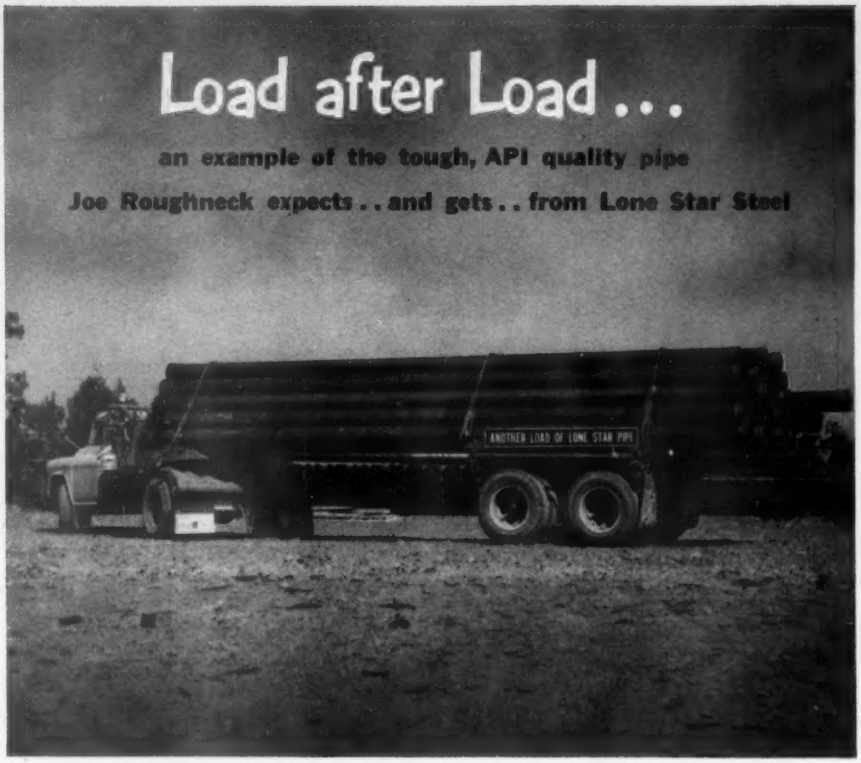
28-30 SGA annual convention, Dallas, Texas.
29-30 PCGA distribution conference, Tucson, Arizona.
29-May 1 PIEA-PESA, joint convention, Adolphus Hotel, Dallas, Texas.

May

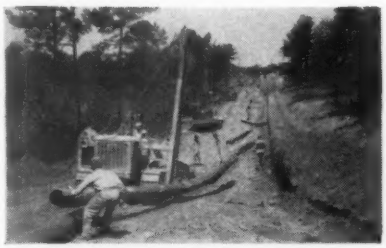
1 PCGA accident prevention conference, Tucson, Arizona.
4- 7 LPGA annual meeting, Conrad Hilton Hotel, Chicago, Illinois.
4- 7 Air Conditioning & Refrigeration Institute, annual meeting, The Homestead, Hot Springs, Virginia.
5- 9 AGA distribution, production, and transmission conference, The Roosevelt and Commodore Hotels, New York, New York.
5- 9 National Restaurant Association convention and exposition. Navy Pier, Chicago, Illinois (AGA will exhibit).
5- 9 AGA commercial gas school, Edgewater Beach Hotel, Chicago, Illinois.
9- Southeastern Gas Association, gas sales conference, Selwyn Hotel, Charlotte, North Carolina.
12-16 PCGA industrial gas school, Los Angeles, California.
15 NEGA operating division, Sheraton-Biltmore, Providence, Rhode Island.
18-21 Industrial Heating Equipment Association, The Homestead, Hot Springs, Virginia.
19-21 AGA mid-west regional gas sales conference, Edgewater Beach Hotel, Chicago, Illinois.
19-23 National Fire Protection Association, annual meeting, Palmer House, Chicago, Illinois.
20-21 PCGA customer service conference, Olympic Hotel, Seattle, Washington.
20-22 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pennsylvania.
22-24 Florida-Georgia Gas Association, annual management conference, Key Biscayne Hotel, Key Biscayne, Miami, Florida.
23 Southeastern Gas Association, gas distribution conference, Selwyn Hotel, Charlotte, North Carolina.

June

1- 4 Institute of Appliance Manufacturers, annual convention and exhibit, Netherland Hilton Hotel, Cincinnati, Ohio.
4- 5 AGA-PCGA joint domestic gas research and utilization conference, Ambassador Hotel, Los Angeles, California.
10-12 Appalachian Underground Short Course, West Virginia University, Morgantown, West Virginia.
11-13 NEGA, operating division, Sheraton Biltmore, Providence, Rhode Island.
15-19 American Society of Mechanical Engineers, Hotel Statler, Detroit, Michigan.
22-27 American Society for Testing Materials, annual meeting, Hotel Statler, Boston, Massachusetts.
23-24 Michigan Gas Association, Grand Hotel, Mackinac Island, Michigan.
24-27 Canadian Gas Association, annual meeting, Manoir Richelieu Hotel, Murray Bay, Quebec, Canada.


Load after Load . . .
an example of the tough, API quality pipe
Joe Roughneck expects . . and gets . . from Lone Star Steel
ANOTHER LOAD OF LONE STAR PIPE

In the heart of the oil country, Lone Star Steel's huge plant is Joe Roughneck's solid source of supply for API casing, tubing and line pipe. Quality-controlled from mining of ore to finished pipe . . Lone Star electric weld pipe meets strict API specifications. Fully normalized, of course.



Crossing rivers, bending over hills and rugged terrain is routine for Lone Star line pipe.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

Lone Star STEEL COMPANY

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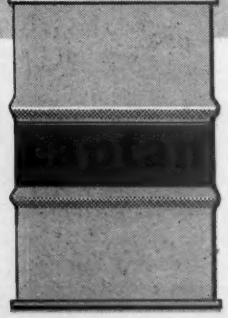
prompt service

from the only plant dedicated exclusively

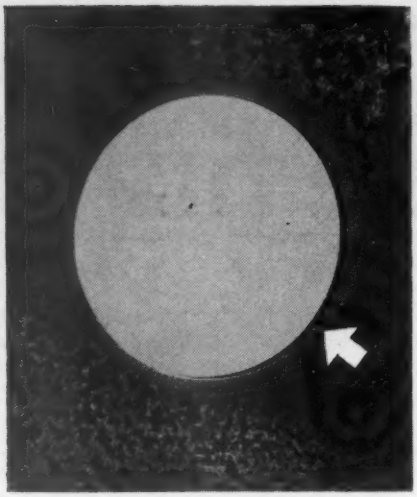
to your odorization needs!



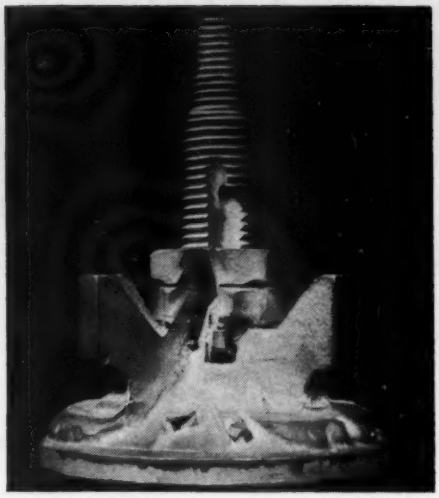
NATURAL GAS ODORIZING, INC.

P. O. BOX 15252 / HOUSTON 20, TEXAS

Pressure control lost with this dust-eroded regulator valve part

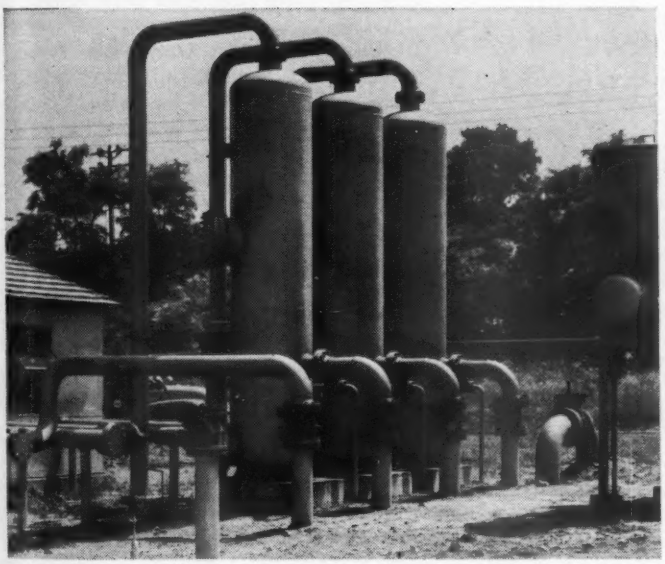


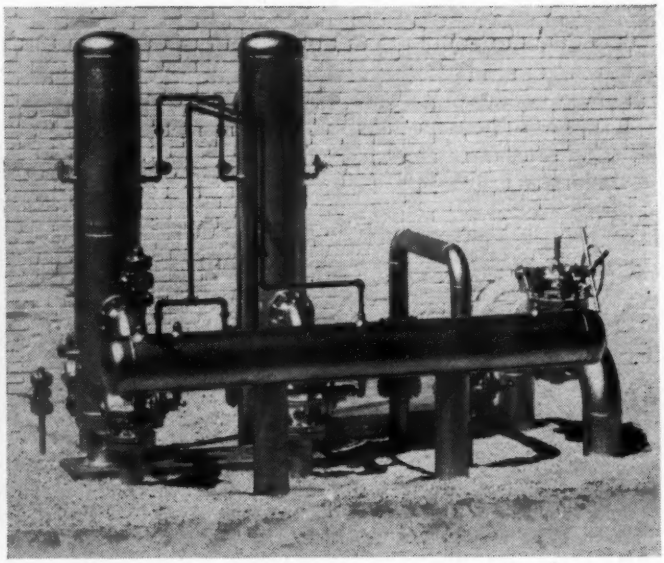
Edge nicked and rounded on this flat plate orifice—caused by dirty gas



Sand-blast erosion by pipe line dust ruins this inner valve

all dust damage prevented with Blaw-Knox Gas Cleaners





Mill scale, construction dirt, well sand and corrosion products are always present in gas lines whether visible or not. But *invisible* dust has the greatest damaging power. These micron-sized particles (20 microns or 0.00078″ and under) travel the farthest to sand blast regulators and other metering devices. They even drift into household appliances causing pilot outages.

That's why it pays to use a gas cleaner that traps and retains even microscopic dust. Blaw-Knox Gas Cleaners take the guesswork out of complete cleaning. Operating on the oil scrubbing principle—the only known way to remove *all* the dust—Blaw-Knox cleaners provide trouble-free fuel that cuts your operating costs, maintains highest customer relations.

Bulletin 2450 shows how Blaw-Knox Gas Cleaners pay for themselves at compressor stations, town boarder stations and district regulators, and it presents a simplified way to select the right size cleaner for your requirements. Send for your copy today.

BLAW-KNOX

BLAW-KNOX COMPANY
Buflovak Equipment Division
1646 Fillmore Avenue, Buffalo 11, New York

SGA: the first 50 years

Pat Loar, *Assistant Editor*

MAY 18, 1908

LIKE MOST SPRING DAYS in Atlanta, May 18 was warm but pleasant. The year 1908 was a bustling one, and around the Piedmont Hotel, activity was spirited as some two score gasmen took chairs in the meeting room. Representing gas companies from 10 different states, they had traveled to Atlanta in answer to a request from R. C. Congdon, manager of Atlanta Gas Light Company and their host.

Promptly at 10:00 a.m., Mr. Congdon called the meeting to order, and the group settled down to its immediate mission — the formation of an association of southern gas companies. The group duly heard and passed a motion to that effect. Chairman Congdon then appointed a three-man committee to draw up the constitution and by-laws, and adjourned until 2:00 p.m.

Committees being what they are, the report wasn't ready by two o'clock, so the group, minus the three men, adjourned until 4:00 p.m., spending the interim inspecting Atlanta Gas Light's gas manufacturing plant.

Back in convention hall at four o'clock, the constitution and by-laws of the newly formed Southern Gas Association were thoroughly cussed, discussed, amended, and finally adopted. Nominations were made, and a slate of officers was elected.

Elected in absentia as president was T. D. Miller of New Orleans Gas Light Company. Congdon, the man instrumental in knitting together the newly formed SGA, was chosen vice president. For secretary-treasurer, the group named Jas. Ferrier of Rome, Georgia, chairman of the committee that wrote the constitution.

SGA thus became one of four "gas associations" begun in 1908. Why this sudden rash of regional associations (eleven had been formed in the first 10 years of the 20th century) in the gas industry?

Perhaps the objectives of the SGA, as expressed in its constitution, give a clue to what the gas industry was attempting to accomplish:

"FIRST, the promotion and advancement of knowledge scientific and practical in all matters relating to construction and management of gas works, and the manufacture, distribution, and consumption of gas.

SECOND, the establishment and maintenance of a spirit of fraternity among the members of the Association and ideas on the beforementioned subject matters.

"THIRD, the inducement and extension of friendly relations between the manufacturers of gas and their patrons, based on the mutuality of their interest."

LITTLE DID SGA'S FOUNDING FATHERS realize the significance that their youthful organization would assume during its next half-century.

From 1816, when Rembrandt Peale received his charter to start the first U. S. gas company in Baltimore, to 1908, when SGA emerged as one of the many newly-hatched associations, the gas industry had spread to 46 states. Practically every major city lighted its streets with gaslights. The industry supplied more than 3,000,000 customers and had more than 30,000 miles of mains in the ground.

By 1908, in many areas, gas consumption in the daytime had reached the point where it exceeded the night time demand, reversing the earlier operations when gaslights were the primary source of revenue.

Practically all of the gas sold in 1908 was manufactured. The SGA, in its formation, didn't consider including the states of Arkansas, Texas, Oklahoma, and New Mexico. Most of its operational problems resolved themselves in gas manufacturing.

Natural gas was still a sleeping giant. Spindletop was "brought in" in 1901 and the Petrolia field in Texas — for 13 years the largest known natural gas field — was discovered in 1904. But, natural gas in 1908 was a stepchild — called a "nuisance" by the oilmen of the era and unconsidered by the gas men.

GAS WAS NO STRANGER in the 10 states comprising the SGA's area at the time of its founding. By 1908, it had been around for 75 years. Gas first came to the region in 1833 at Wilmington, North Carolina, where it was used to light the streets of that city.

In 1835, gaslights made their appearance in the Crescent City, and many a stranger arriving and departing by riverboat remarked on the wonderful lighting in New Orleans. Some 12 years later, in 1846, gas plants were also established in Charleston, South Carolina, and Frankfort, Kentucky.

Townsfolk in Savannah, Georgia, became disgusted with their oil street lamps and in December, 1848, converted 16 of them to gas, marking the beginning of Savannah Gas Company; in 1852, Savannah extended its lighting method to the famous "Savannah Beacon" for passing vessels.

In the next 13 years, gas moved quickly into the lives of many Southerners. Nashville, Tennessee, lighted up the city in 1851, Memphis followed in 1852, and Knoxville in 1854. The year 1852 also marked the entry of Virginia into the gas ranks, with Petersburg firing gaslights for the first time, while in Mobile, Alabama, a new gas company to provide lighting was chartered. Birmingham, it seems, was more conservative; gas lighting didn't arrive there until 1880, when 20 street lamps were turned on — but only when the moon was not shining!

Texas was not to be outdone even in the early days of the gas industry. Galveston, major shipping center in the mid-19th century, chartered its first gas company in 1858.

Gas also came to Mississippi in 1858, with historic Natchez embellishing its southern hospitality with the soft golden glow of gaslights. In 1861, two widely separated cities in the SGA area saw their first gaslights — Jacksonville, Florida, and Little Rock, Arkansas.

Almost 30 years later, Indians, tourists, and natives alike witnessed the first gaslights in Santa Fe, New Mexico. Exact date of the establishment of the manufactured gas plant in that city is not known, but it was in the later 80's.

Last, but not least, gas came to Oklahoma in 1903. The Sooner State can chalk up at least one notable fact in gas history — it was the only one of the 14 in the SGA region that started out with natural gas; it was in 1903 that a gas line was laid from a well north of Tulsa to a brick plant in that city.

SINCE ITS INCEPTION, SGA has been known as one of the most progressive associations in the gas industry. The founders and early members realized that an association must provide more than just "fraternity"; it must do things collectively for its membership to improve its industry.

SGA has worked closely with national gas industry organizations, beginning with its affiliation in 1915 with the American Gas Institute and the American Gas Association, formed in 1918 by consolidation of the then existent two national groups. In 1922, SGA began work on the establishment of a course in gas engineering, which was realized in 1924 when the course was first offered at Johns Hopkins University. By 1925, it was the largest regional association in the U. S., and grew even larger in 1929, when the natural gas phase of the industry came into its first prominence.

Introduction of natural gas into the southeast with the construction of Southern Natural Gas Company's pipeline and others in the same period brought many new problems. Among them were tremendous difficulties involved in the conversion to natural gas by the many distribution companies, who had previously served only manufactured gas. Not only did it involve conversion of domestic and commercial appliances, but many companies practically had to rebuild their distribution facilities to accommodate the tremendous increase in gas usage.

Operating problems weren't the only ones brought on by natural gas. Rate schedules had to be reconstructed and appliances had to be merchandised. The SGA's territory was most seriously affected by this complete reversal of the gas industry, and through the pioneering work of SGA, the solutions developed have aided in the subsequent expansion of the natural gas industry.

WORLD WAR II put the finishing touches to the manufactured gas phase in the SGA region and opened up new vistas for natural gas. In the postwar period, the clamor for natural gas resounded from every corner of the nation, and the SGA area responded. The big push to find, transport, and deliver natural gas was on.

Since 1945, gas reserves have doubled, well completions have doubled, and marketed gas production has increased 2½ times. Nearly two and one-half times as many of the nation's gas customers use natural gas today as in 1945.

In just 10 years, the SGA area has seen a fabulous growth in the natural gas transmission industry, most of it in the SGA area. Large diameter, long distance pipelines have snaked their way from Texas, Louisiana, Oklahoma, and New Mexico to every nook and cranny of the U. S.

At the end of World War II, the activities of SGA were so broad and so many that the association revised its constitution and by-laws, and established a permanent office in Dallas with a full-time managing director. Selected for the rigorous task of handling SGA affairs was Robert R. Suttle, who assumed his duties at the first peacetime meeting of the SGA in Galveston in March, 1946. Recognized today as one of the industry's top men, the veteran, vigorous Suttle has been instrumental in guiding SGA to a position of leadership among gas associations during the hectic postwar growth of the industry.

In 1908, annual sales of gas totaled only 48 billion cu ft and averaged only 600 Btu per cu ft in heat value. Fifty years later, the nation consumed nearly 750 billion cu ft, most of it 1000 Btu natural gas — nine times as much in cu ft and 15 times as much energy!

Today, SGA can point proudly to statistics when it and its member companies are compared to the entire gas industry. For example, in the 14-state SGA region, you will find:

84% of all proved reserves
83.5% of all natural gas production
43.5% of all transmission mileage
26.6% of all distribution mileage
19.5% of all gas customers
38.1% of all gas sales
30.0% of all industrial gas sales
and, finally, that the SGA region supplies 21.5% of all the U. S. energy!

FATE HAS PLACED SGA IN AN ENVIABLE POSITION. The industry's reversal from manufactured to natural gas has contributed greatly. SGA's area is blessed with abundant resources and chief among them are its hydrocarbon reserves. But, SGA is also blessed with the most important natural resource — men with vision, aggressiveness, and the ability to get things done.

The gas industry in 1908 was still an infant. It was yet to scratch the surface of its vast potential. The seven big residential uses of gas being promoted in 1958 weren't as familiar then as they are now. Commercial and industrial applications were still curiousities. Air conditioning was undreamed of.

Gaslighting still dominated the industry in 1908. Two residential uses of gas — cooking and room heating were just becoming established. Electric competition even then was a problem. Gas was still king for street lighting, but Mr. Edison's marvelous lamp was making inroads. Thanks to an ingenious German named Welsbach and his development of the gas mantle lamp, the industry not only survived in the early 90's, but was able to impress the public with the necessity for such lights. Gas lighting began to appear in homes, stores, and factories. The fabulous "Gaslight Era" came into being.

The swing to gas cooking got its start in the "Gay Nineties," and the transformation was nearly complete when World War I began. Gas ranges brought new control and reliability to cooking, the result of an adaptation of the Bunsen burner. By 1908, nearly 3,000,000 gas ranges were in use and over 35 firms were manufacturing them.

From the gas range to the gas heater was but a short step. The great "Gas Heating Rush of 1909" came on the heels of SGA's formation. Many ingenious and attractive heating stoves were utilized in securing new business.

Gas water heaters were still new, but the growing demand for them provided an enormous impetus to gas industry growth.

Refrigerators and air conditioning were things of the future in 1908. Practical gas refrigeration came to the U. S. in 1926 from Sweden, a further development of the Electrolux principle. By 1927, the gas refrigerator, made by Servel, was available commercially and promoted extensively.

In 1929, the first gas-fired air conditioning unit was installed in a Pennsylvania theater. AGA's Committee on Industrial Gas Research in 1933 set a goal to "condition a whole house throughout the summer at a cost of $100 or less."

Today, 25 years later, the gas industry is moving ahead rapidly in selling gas for year-round air conditioning. To the credit of SGA, the big gains in gas air conditioning have been made in its area in the 25-year interim.

THE FIRST 50 YEARS ARE THE HARDEST, and SGA can look back proudly on the "Golden Era" just past. Its accomplishments have been many and its growth, both by the organization and by its member companies, has been astonishing. Its membership roster today includes 81 gas companies (including 24 of the nation's largest transmission firms) and 221 associate member companies, comprised of manufacturing service and supply firms to the gas industry. Annual conventions in recent years have had attendance figures far above 2000 persons, making SGA the second largest association meeting the industry holds each year.

Only time can tell what the future holds for SGA. If the past record is indicative of what the future may be, the gas industry can rest assured that SGA will continue progressing and make outstanding contributions to the success of the gas industry.

New study reveals interesting facts about . . .

Outdoor vs Indoor Meter Settings In Northern Climates

L. C. Rohret
Middle West Service Company
Chicago, Illinois

SETTING GAS METERS OUTDOORS in northern climates is a subject that has been carefully avoided by many gas men. Apparently, it has been avoided not because of what they knew about outside meter sets, but because of what they did not know, and it appeared to be a case of letting the sleeping dog lie.

The author became interested in the subject of outdoor meter sets as it seemed to hold possibilities for bettering service, and it appeared to be only a question of whether or not there would be any marked increase in unaccounted for gas due to low winter temperatures which would result in higher operating costs.

In discussing the subject within the industry, it was found that few were willing to consider the matter for various reasons, or else they were definitely opposed to the idea of setting meters outdoors. Several had made calculations based upon what appeared to be faulty data, and they did not like what they found, and a few casual tests were made which proved nothing.

In the course of a number of discussions, it was found that the men who were receptive to the idea for setting meters out of doors were of the opinion that the difference between outdoor and indoor readings would be between three and five percent over a 12-month period, in spite of the fact that a number of cold-box tests showed results that were considerably higher. This group felt that a minimum continuous test period of at least 12 months under actual service conditions would result in a more satisfactory test than laboratory tests conducted over short periods of time, no matter how carefully the tests might be conducted. The results of this study appear to justify their contentions.

Studies Planned

Several companies were interested in the subject and were willing to cooperate in making some tests under actual field conditions, which could be combined with the tests made by other companies for a more comprehensive study than any one company cared to make upon an individual basis.

At first it was planned to set up a standard procedure so that each of the companies would conduct their tests on the same basis and the results would be directly comparable. The plan proposed that each company would make a number of tandem indoor-outdoor meter sets on residential installations, some of which would use gas for domestic purposes only, and others would use gas for space heating as well. Among the space heating customers, some would be small users and some would be large users. This, it was felt, would give a more representative cross-section of the customers and would more nearly approximate the average customer requirements.

In addition, all meters were to be tested and each pair of meters having the same metering characteristics, from check to open flow, were to be selected for setting in tandem. It was intended that all meters would contain synthetic diaphragms to minimize still further any variations in metering characteristics.

Through some errors, which later proved to be most fortunate, it was found that a number of meters with leather diaphragms had been inadvertently included. But, by a most happy coincidence, the meters with leather diaphragms were all set out of doors, while their matching meters with synthetic diaphragms were set indoors, which provided information unlooked for in the planned study. This will be discussed later in this article.

Additional Studies Included

After the tests were started, several companies that were conducting tests of their own kindly submitted the results of their tests for inclusion in this study, with the result that this study includes a total of more than 500 meters located in Illinois, Wisconsin, and Michigan, which have been under observation from two to four years, and represent nearly 2000 meter years of experience.

The companies that were not included in the original plan had set up their own standards and methods of test that again proved to be fortunate, as they provided data under other test conditions. The companies reporting in Wisconsin and Michigan conducted their tests using synthetic diaphragms with the inadvertent inclusion of a few leather diaphragms mentioned earlier; the Illinois tests were conducted with leather diaphragms both inside and outside. The results of the different methods of test varied by only a fraction of one percent over the year, and it is felt that any of the several techniques used are equally satisfactory if the tests are carefully conducted.

Results of Tests

Results obtained in the different states all follow the same trend in the

Table 1. Percentage Differentials Between Indoor and Outdoor Meter Settings in Northern Climates.

	Illinois	Michigan	Combined
January	3.33	4.80	3.37
February	4.27	2.77	4.22
March	2.88	4.08	2.92
April	.06	.87	
May	1.47	1.84	1.48
June	(.33)	(.94)	
July	3.64	(.29)	3.51
August	2.52	(.88)	2.39
September	(.65)	.60	
October	1.21	1.50	1.22
November	5.75	2.60	5.63
December	6.20	2.95	6.10
12-Month Period	3.41	2.63	3.29

( ) Denotes red figure

monthly readings and the variations, which are most obvious during the periods of low consumption, are probably due to some local condition.

Gas consumptions for the Illinois and Michigan meters are reported by months, which provided an excellent opportunity to study the performance of the meters under changing temperature conditions.

Early in the tests, it was observed that a number of the outdoor meters were not following the pattern anticipated, which caused us to think that these meters might contain leather diaphragms. These meters were inspected, and what was suspected was found to be correct; they were equipped with leather diaphragms. Recognizing that we were obtaining valuable data we had not anticipated receiving, these sets were left undisturbed and an analysis was made of the results.

The analysis of the results from tandem sets with leather diaphragms set outdoors and with synthetic diaphragms set indoors showed very definitely a greater difference between the readings than when either leather or synthetic diaphragms were used both indoors and outdoors. It is felt that an evaluation of these differences based upon so small a number of installations would not be conclusive, and that further study should be made of this phase of the subject.

All of the Illinois tests were made with meters equipped with leather diaphragms. These, too, show a greater differential than meters equipped with synthetic diaphragms.

Monthly figures for Wisconsin are not available, but the average percentage of differential for the test periods, which vary from two to four years for the different meters, amounts to 3.30 percent, which is almost the same as the combined figure for Illinois and Michigan of 3.29 percent.

From observations made of meters with leather diaphragms and compared with meters with synthetic diaphragms located indoors in the same area, the meters with leather diaphragms appear to run consistently slower than meters with synthetic diaphragms, at low gas temperatures.

It also appears that the break-away pressure at lower temperatures is higher for leather than for synthetic diaphragms. The present data is insufficient to determine if this relationship remains the same at higher temperatures.

Table 1 shows the average percentage differentials by months and for an average year, by states and as a combined figure. This tabulation includes all of the meters, whether with leather or synthetic diaphragms.

It is felt that, had the test period of all the meters been for a minimum of four years, the average monthly figures by states would more nearly coincide with each other and with the combined averages.

Effect on Earnings

At first glance it might appear that the annual differential due to outside settings might result in a serious loss that would be reflected in earnings. If the average annual consumption per customer is 100 Mcf, and the average revenue per Mcf is $1, the revenue drop would amount to $3.29 per meter per year.

This, however, would be partially offset by the savings to be effected in meter reading where the time now lost by going to the door, waiting to be admitted, removing overshoes in bad weather, going to the basement to read the meter, putting on overshoes and returning to the front of the house, would be saved.

In addition to this, the call-backs due to inability to gain entrance at the time the route is being read are entirely eliminated. These skips amount to 20 percent of the total meters read in some instances. Companies leaving cards for the customer to fill out still have the extra cost of processing these cards before the bills can be made out.

The foregoing paragraph is based on the assumption that the billing is done on a cubic foot basis and that there should be a loss in revenue. It should be pointed out that the customer's heat requirements remain the same and his Btu consumption will remain the same. Actually, then, there is no logical reason why the rates, where meters are set out of doors, should not be adjusted to provide the same amount of revenue for the same service.

Companies billing on the therm basis could make this adjustment without the necessity of making a rate adjustment.

Why Not Outdoor Sets?

There is nothing illogical about the foregoing, as the same thing is being done today, but on a lesser scale, by all companies. All rates are now set to compensate for the difference in the metering temperature of gas supplied at a low ground temperature in the winter and a relatively high ground temperature in summer, as well as to compensate for unaccounted for gas losses due to other causes.

For the most part, customers like the outside meter sets as it saves the housewife the annoyance of answering the door and of having the home tracked up in bad weather by even careful meter readers. With the present trend of converting the basements into game rooms, many of the customers are glad to have the gas meter out of doors and out of the way.

On the other hand, a few object for aesthetic reasons to having the meter located out of doors, but we must remember that the electric companies went through that stage where the customers objected at first to having the electric meter hung on the side of the house, but the practice now has general acceptance.

Other Advantages

Another point may be mentioned here in passing, and one which should be given consideration. With the meter set out of doors, the gas company has no property or equipment within the house. The customer's piping, then, starts at the gas meter connection which is out of doors. The company has no cause for entering the premises except on the rare occasions when a meter is changed or service is interrupted for some other reason and it becomes necessary to relight the pilots and restore service. Barring seepage of gas through the ground and into the premises due to a main or service leak, where does the company's liability start and stop, and what would be the effect upon the insurance rate?

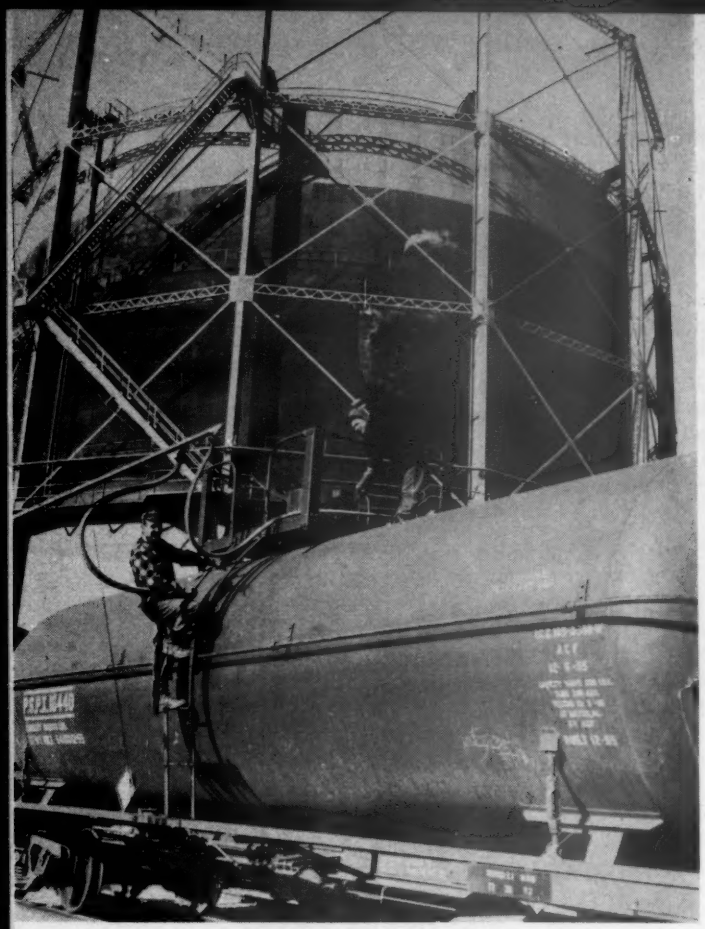
No differentiation was made in this study either as to the manufacturer of the meters used or of the meter design, although the meters were all hard case. Therefore, this study does not disclose if there is any difference in the performance of the meters manufactured by the different companies or of the different meter designs.

This study does not cover a sufficient period of time to determine if the life of the meter would be shortened, but meters set for years in less severe northern climates show no indication that the life of an outdoor meter is shortened by such exposure.

There is no reason to believe that the performance of tincase meters would differ materially from the hard case meters used in this study, although the tincase meters could hardly be expected to have the durability of a hard case meter when exposed to the elements.

Conclusions

Conclusions to be drawn from this study are that gas meters may be set out of doors in rigorous climates, and if the small differentials between indoor and outdoor settings are recognized and compensated for, the result would be no increase in the cost of the service being rendered to the customer. There would actually be a saving to the company in the cost of meter reading, more satisfactory public relations, and a possible change in company responsibility and liability which might result in insurance savings. * * *



Tank car of liquid propane is quickly unloaded by Laclede crew at stand-by plant.

In St. Louis, Laclede Gas Company personnel and facilities faced up to a frosty February question . . .

How Good is Really Cold Weather For A Gas Company?

IF YOU WORK FOR A GAS COMPANY, sooner or later on a very cold day, someone will say to you, "Boy, this is really good for you folks, isn't it?"

Somehow, the public seems to think that the colder the weather and the more gas that is sold, the greater are the profits of the gas company.

Up to a point, this is true. But only up to a point. When demand exceeds available pipeline supply, gas companies must turn to other sources to keep their customers in full supply.

In February of this year, Laclede Gas Company of St. Louis experimented such an event — extremely cold weather over a prolonged period that called for use of every available source of supply. Laclede, fortunately, had available three sources of supply for "stand-by" or "peak shaving" gas: Oil-gas, propane-air, and underground storage.

Of the three, storage gas from underground is by far the least expensive, representing the original investment of gas from the pipeline plus fixed costs of investment, rental of property rights, and labor.

Although Laclede's storage project near Florissant is still in its infancy, during the first 20 days of February more than 500,000,000 cu ft was withdrawn in quantities up to 46,000,000 cu ft per day.

This was far more than anyone could have expected. But the weather was colder — and lasted longer — than at any other time in recent St. Louis history. It is to Laclede's credit that the reservoir and equipment performed so well, so soon.

Even with this vast underground storage supply, additional supplemental gas was required. To make up the difference, Laclede relied on its propane-air and oil-gas plants.

As far back as 1946, Laclede began establishment of its propane-air gas facilities. Presently, storage facilities at its Catalan Street Station and at Shrewsbury have a capacity of nearly 2,000,000 gal of liquid propane, the equivalent of 175,000,000 cu ft of gas. This supply is continually replenished through tank car shipments.

The propane-air gas facilities provide an extremely flexible stand-by source. But sudden procurement of additional supplies of LPG can be a tricky business — especially when a cold wave is felt from coast to coast and suppliers are loaded with orders from everywhere at once. And it is expensive — about $1.20 per Mcf, exclusive of fixed charges on plant investment. By contrast, Laclede's average selling price for gas is about 80 cents.

Even more expensive is oil-gas, which costs Laclede about $2 per Mcf, to produce. Even so, Laclede has facilities at its Station "A" and at Shrewsbury to produce up to 17,000,000 cu ft of oil-gas per day when necessary. These plants were converted to oil-gas use when the company switched from manufactured to natural gas years ago.

Why Use Stand-by Gas?

Without its peak-shaving facilities, Laclede would have had to either cut its customer load to the amount it could supply from the pipeline on the coldest day, or else arrange for greater pipeline supplies.

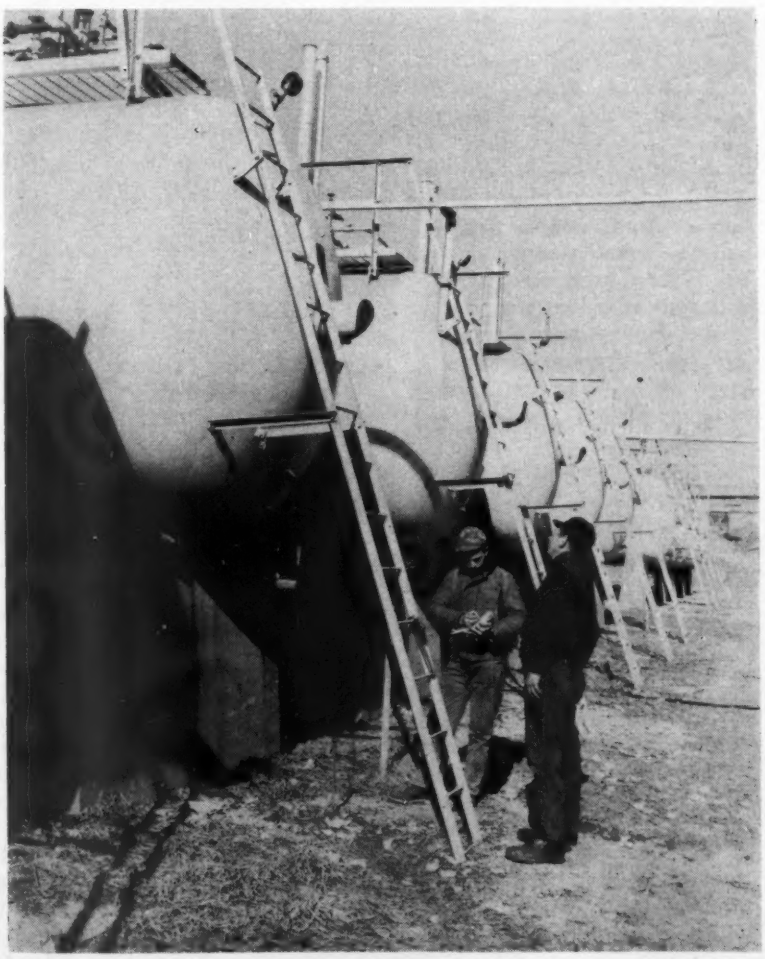
Either alternative would cost far more than stand-by gas. To cut customer load would, conservatively, have reduced revenues by about 20 percent, or $7,000,000 annually. To contract for additional pipeline gas, at the present demand charge, (even if it were available) would have cost at least $3,000,000. By contrast, the cost of the propane-air and oil-gas manufactured in the current season is estimated at below $1,000,000.

With Laclede, as with other gas utilities across the nation, the popularity of natural gas for residential

Photos courtesy *Laclede News*, employee publication of Laclede Gas Company.

Key factor in Laclede's ability to meet heavy peak demands was underground storage reservoir near Florissant. Shown here is the compressor plant at the storage facility. Up to 46,000,000 cu ft per day was withdrawn during bitterly cold February weather.

Workmen at Catalan Street propane-air plant check supply. Laclede has storage facilities for 2,000,000 gal of liquid propane.



heating, especially in prolonged cold weather, produces an increasingly calculated risk.

How Good Is Cold Weather?

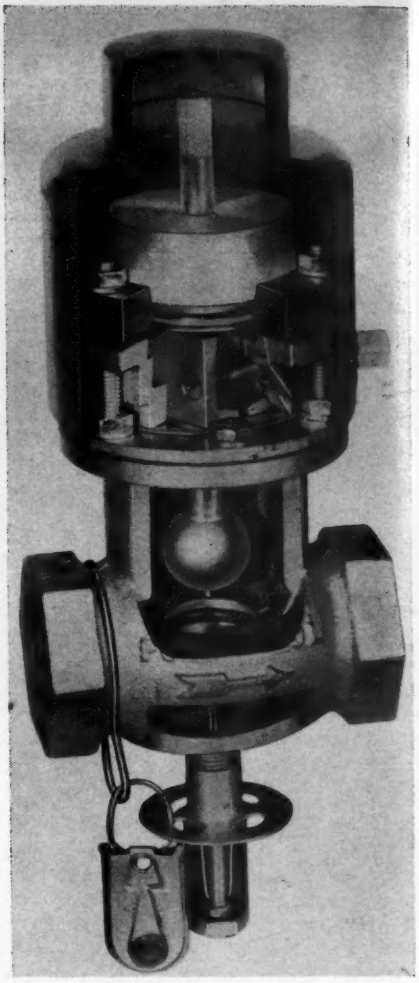
Experiences of Laclede, as well as other companies, show that unusually cold weather can be as costly as a very mild winter. The "best" gas sales weather occurs when the gas load is such that the full deliverability of the pipelines is being utilized. For Laclede, during the past winter, this meant average temperatures of 32 to 36 F.

The cold wave in February proved several things for Laclede: First, that underground storage is capable of supplying gas in good quantities, day after day; second, that Laclede's distribution system and operations facilities can take the worst weather that Old Man Winter can dish out. And, finally, it proved the cooperative spirit of St. Louis industries, who voluntarily limited their use of gas during a 24-hour period when it appeared an unprecedented amount of gas might be needed for residential use. Fortunately, the weather abated, and rail shipments of propane arrived on schedule, limiting the time necessary for such action.

Most of all, the cold wave proved that Laclede employees, even under the most trying conditions, gave the best service possible. * * *

New Automatic Safety Shut-off Valve Provides Economical Protection

Frank F. Buck
Handley-Brown Heater Company
Jackson, Michigan



IT IS NOW POSSIBLE to provide gas customers modern service with extensive safety protection without increasing the cost of current installations. The device is a valve that not only serves as a manual shut-off, but also provides automatic shut-off in the event of excessive pressure, inadequate pressure, excessive temperature, and flooding. This new valve has been named the "Master Poly-Trol" after its sister valves, the standard and high-pressure "Poly-Trols," and is compact, provides extremely accurate shut-off, and normally costs no more than the equipment and labor that it eliminates.

The Master Poly-Trol, in a sense, antiquates contemporary service cocks by providing a more desirable manual shut-off that is tamper-proof and never needs lubrication. Gas may be turned off by the homeowner, as required, but cannot be turned on by anyone except the gas company. This complete tamperproof feature was designed into the valve to eliminate the possibility of forgetful customers turning on the gas without lighting all pilots. Manual shut-off is accomplished quickly without wrenches or special tools. This easy and rapid shut-off is of especial interest to those concerned with shut-off during emergencies.

The automatic feature of the valve has been provided to specifically cope with four conditions that confront gas utilities from time to time. These, rated in the order of their importance, are:

excessive pressure,
inadequate pressure,
excessive temperature,
flooding.

Each of the four conditions represents a danger in one form or another to the service and to the inhabitants of the building. By providing a rapid, automatic shut-off at a service entrance when any of these occur, the most inherent dangers are effectively combated. For example, by automatically turning off the gas in the event of a fire, the new device greatly eliminates much of the possibility of having a gas-fed fire.

Installation of the valve is made where the service cock is normally located, ahead of the house regulator and meter. This type of installation eliminates the necessity for regulator vent lines and permits use of inexpensive, non-seal type regulators. A flexible control line, supplied with the device, connects the unit with the fuel line at the outlet of the meter or beyond. Recommended practice is that the control line be connected as near to the ceiling as possible to provide maximum fire protection.

Basic parts of the Master Poly-Trol are the control line, diaphragm, permanent magnet, and a "ball-like" valve assembly. The principal function of the control line is to transmit increases and decreases in gas pressure from the fuel line to the control chamber. Changes in pressure allow the diaphragm to move upward or downward.

When an appreciable pressure change occurs, this information is transmitted by the diaphragm to the permanent magnet. Magnetic flux created by the magnet holds the valve assembly up and in this position, gas is permitted to pass through the valve. Whenever this magnetic flux is diverted from the valve assembly to another area, the valve assembly is permitted to drop into a neoprene seat and the flow of gas through the valve is stopped.

As an illustration of how these parts combine to make the valve function, take the case of an excessive pressure condition. First, this abnormal pressure in the fuel line is transmitted via the control line to the control chamber. Upon entering the control chamber, the pressure pushes the diaphragm up and by way of linkage the diaphragm raises the permanent magnet away from the valve assembly. Because the magnet is pulled away from the valve assembly, magnetic flux is diverted from it to another area and the assembly is permitted to drop into the neoprene seat and gas is shut-off. ★ ★ ★

Iowa Public Service Company's experiences provide guide on . . .

How To Plan New Gas Distribution Systems

Thomas L. Mitchell
Gas Field Engineer
Iowa Public Service Company, LeMars, Iowa

IN THE ORIGINAL DESIGN OF A GAS DISTRIBUTION SYSTEM, (the difference between original and final design is due to changing conditions, policies, etc., affecting the layouts) certain items of information must be known or decided upon as a basis. Part of these must be determined from the pipeline supplier; others include company policies that determine the actual construction practices.

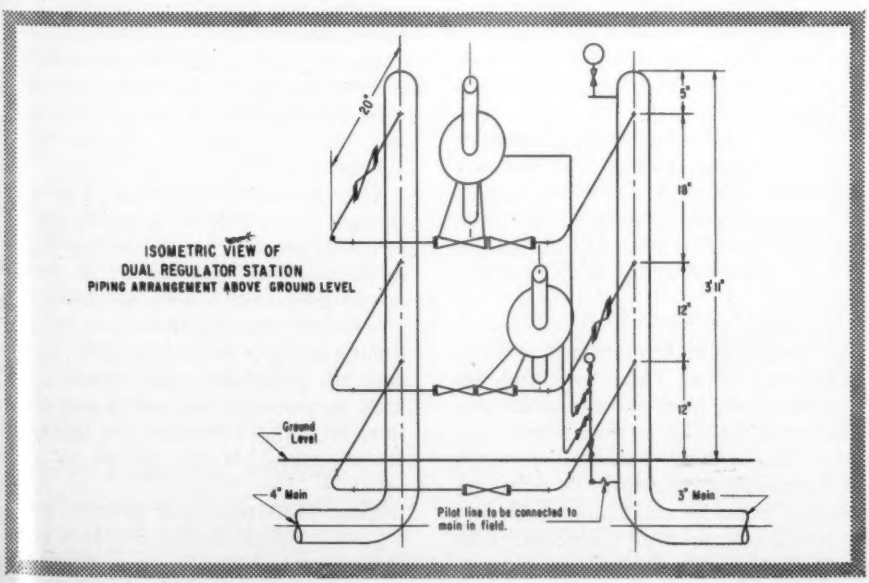
Two very important facts must be determined from the pipeline supplier before the original design can be started. The first is *maximum town border delivery pressure*. In the case of Iowa Public Service Company, the maximum pressure set up by our supplier, Northern Natural Gas Company, is 50 psi and all designs are based on this pressure.

The second fact is the *location of town border station*. In the case of towns that the pipeline supplier has in his FPC docket, this fact may be determined to a rough extent from his exhibits. In the case of towns for which we are interceding, we decide on a town border station location based on projected pipeline routes and actual visits to the sites to determine the best location. Difficulties can arise from this, of course, and cause some rather radical design changes from the original to the final design, because of the fact that the town border station location is decided upon by the pipeline supplier and this location may vary to quite some degree from the distributor's projected town border station location.

Actual construction practices are determined by the company policies and these policies determine the design. One policy, under discussion at the present time in our company, is the maximum design distribution pressure. At the present we design for a maximum pressure of 10 psi, but due to inherent cost savings, considerable thought is being given to increasing the maximum distribution pressure to 25 psi. All present designs are based on 10 psi distribution systems. (At the end of this article, a comparison is made between the 10 psi and the 25 psi systems.)

As to how the actual design of the integral parts of a gas distribution system are concerned, there are six major parts as used in our plant accounting:

1. Mains
2. Odorization
3. Pumping and Regulating
4. Services
5. Regulators — Customer
6. Meters.



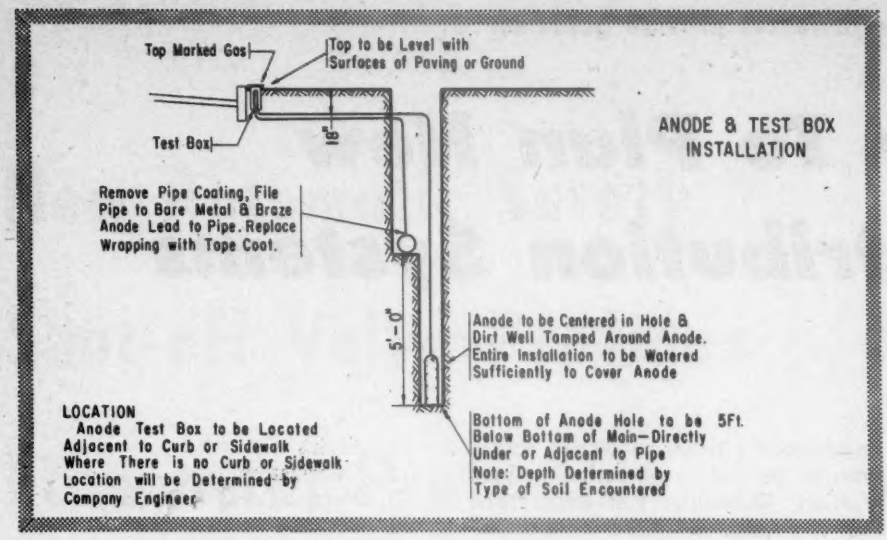
Mains

In the actual design of the mains for a distribution system, one is primarily concerned with capacity, both initial and ultimate. The first step that we take in our original design is the extensive use of the town plat. This use of the town plat involves a considerable amount of field work in order to obtain the information needed for any future steps in our design procedure. Information that is obtained and placed on the town plats consists primarily of the following:

1. Actual house count and location.
2. Schools, churches, commercials, and industrials with locations.
3. Available information as to present fuels used for cooking, water heating, and heating.
4. Yearly fuel consumptions and costs on schools, churches, large commercials, and industrials. This is determined from actual customer contact.
5. Street finish: Gravel, black top, paving, etc.
6. Any unusual terrain features such as deep side ditches, streams, wide streets, etc.
7. Future load potentials.

As can be noted from this list, all of the information must be determined in the field and much of the information is more easily determined if one of our field employees is used on the survey.

With town plats brought up-to-date and printed, we are now ready to start the actual design. From these plats we are able to establish the load centers and positions of large consumers so that we can sectionalize the town as far as capacities are concerned. The other factors involved in our design are the pressure drops that we intend to use. Our policy, as far as pressure computations are concerned, is this:


Top Marked Gas
Top to be Level with Surfaces of Paving or Ground
Test Box
8"
ANODE & TEST BOX INSTALLATION
Remove Pipe Coating, File Pipe to Bare Metal & Braze Anode Lead to Pipe. Replace Wrapping with Tape Coat.
5'-0"
Anode to be Centered in Hole & Dirt Well Tamped Around Anode. Entire Installation to be Watered Sufficiently to Cover Anode
LOCATION
Anode Test Box to be Located Adjacent to Curb or Sidewalk Where There is no Curb or Sidewalk Location will be Determined by Company Engineer
Bottom of Anode Hole to be 5Ft. Below Bottom of Main—Directly Under or Adjacent to Pipe
Note: Depth Determined by Type of Soil Encountered

1. Town border station delivery pressure — 50 psi.
2. Pressure at inlet to district regulator stations — 25 psi.
3. Pressure at outlet of district regulator station — 10 psi.
4. Pressure at end of distribution mains — 2 psi.
5. Minimum design conditions as follows:
   Residences—120 cu ft per hour,
   Commercials — 150 cu ft per hour,
   Large commercials, schools, churches, and industrials — estimated hourly load.
6. Assume load to be concentrated at a point 60 percent of the distance from the feed end to the end of a dead end main, all other loads to be taken at point of delivery.

These pressures are, of course, the minimum conditions that we will allow on the systems. By observing these pressure conditions and taking into consideration the rest of the design conditions, we have experienced no difficulties as far as capacities are concerned.

I would like to state that in our computations we use the AMERICAN GAS JOURNAL "Flow Computer" to determine main sizes and capacities.

It might be interesting to point out a few of the other design conditions that directly affect the design size of the mains. Most common cause for needing large capacity mains is having to carry large quantities of gas across the distribution system to serve a large commercial or industrial load at the opposite end of the town from the town border station.

Two items that cause both a considerable number of design problems and cash expenditure are **peak shaving** and **conversion.** I mention these two together because in our company we consider only peak shaving, at the present, in those towns that are converted and where we utilize existing equipment.

The last item is **future load growth.** This problem of future growth or additions of anticipated large loads can be prepared for by designing for future tie-ins of header mains or dead-ends, future extensions of high-pressure mains, or pressure elevations of existing distribution to high pressure.

The pipe that we use is as follows:

Standard line pipe
API plain end black steel line pipe
Buttweld line pipe.

Pipe is purchased in double random lengths when it is to be used in construction. Pipe from the steel mill goes to a coating and wrapping plant where it is mill-wrapped to the following specifications:

1. Steel shot cleaning
2. Mechanical priming
3. Hot coat pipeline enamel—3/32-in. thickness
4. One wrap 15 lb asbestos pipeline felt
5. One wrap heavy kraft paper
6. Electrical holiday inspection.

We specify a semi-plasticized enamel, which gives us good pipe handling characteristics in the winter as well as summer.

Coated and wrapped pipe, together with magnesium anodes and isolating insulators, gives us system cathodic protection. Anodes used are 17-lb, with the high current output, and are installed as shown in the accompanying diagram.

Isolating insulators used are insulating compression fittings or insulating flanges on valves. These insulators are installed at the town border station connection point, and at distribution sectionalizing valves. This sectionalizing of the distribution system by using insulators provides relatively small area to patrol in case of an accidental short in the protected system.

Protection used on the pipe joints is an insulating roll tape. This protection as outlined here has given us as high as an average of −1.45-v pipe-to-soil potential, with reference to a copper sulfate half-cell.

Type of construction used is all welded. Therefore, all fittings are welding fittings, ells, tees, flanges, etc. For branch lines, instead of using tees and welding reducers, weldolets are used. When two branch lines take off at the same place, two weldolets are offset from each other to reduce the side strain on the header main.

Valves are lubricated plug type, 125 psi test, with flanged ends. The number of valves installed will be only those necessary to sectionalize the distribution system into areas containing approximately 150 customers for emergency turn off-turn on procedures.

One consideration given to the installation of these valves is that each flange shall have a piece of pipe welded to it with a minimum length of two feet. The valve and flanges are made up above ground, and then installed in the pipe below ground to eliminate strain on the valve body itself.

The problem of relief valves is discussed with the "B-31" code in mind for the protection of the distribution system and ultimately the customer. We are not installing relief valves on our systems for several reasons:

First, our supplier has a relief valve on its border station that will relieve in the event a too high delivery pressure is reached.

Second, all of our systems are designed for dual regulation; that is, either a district regulator station plus a house regulator or high-pressure service regulator plus a house regulator. We feel that the laws of probability are quite good in our favor that both the supplier's regulator and our first cut regulator will not fail simultaneously.

Third, our distribution system is designed and tested to withstand 100 psi, so that the system is structurally strong.

Fourth, we use a service regulator with internal relief to eliminate excessive pressure build-up on the meter and house piping.

One final item under this discussion on mains has to deal with the location of the mains as to where they are finally laid. As far as the initial design is concerned, this does not have to be great a bearing other than to necessitate a main on each side of the street in the case of extremely wide streets or if rock is encountered during construction, or perhaps running the mains in alleys instead of the streets or vice versa.

Conditions that have greatest bearing on the final design and in a great many instances the design, as far as the

layout is concerned, are changed in the field during construction. The longer one spends in determining these factors beforehand, the fewer are the changes required in the field. A few of these factors that determine actual main location area:

1. Terrain — deep ditches or flat?
2. Soil — good dirt or clay, sandy, rocky or as in one of our towns, limestone?
3. Distances — wide streets, position of house on lot, no alleys, etc.?
4. Buried obstacles — telephone cable, water mains, storm sewers, sanitary sewers, etc.?
5. Public relations — dig or auger streets, clean up in parkings, etc.?

One result of recent construction and future construction of curb and gutter, storm sewer, etc., by the city has been a decision that mains will be laid as close to the property lines as feasible in order to eliminate conflict with city construction.

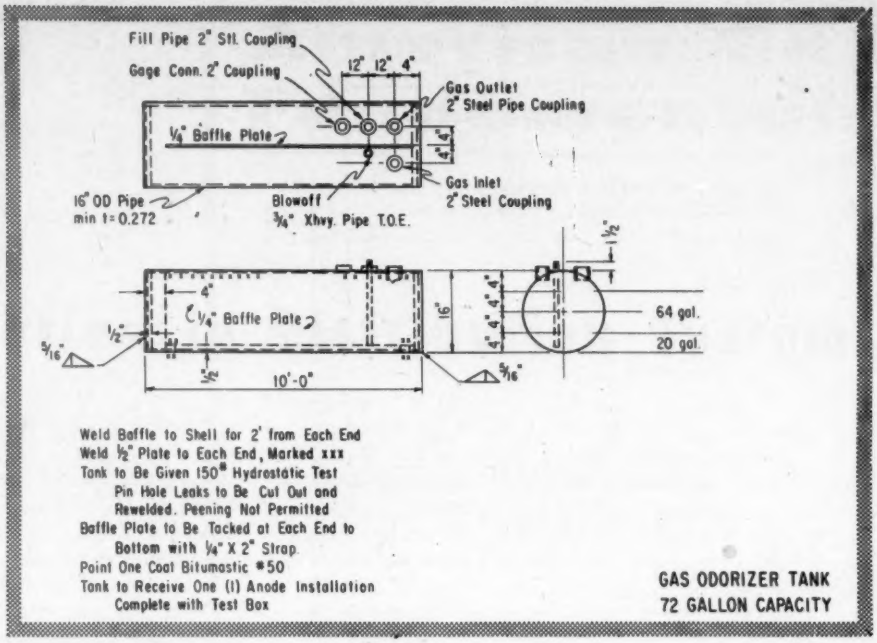
Odorization

The problem of odorization is indeed a thorny one when you try to achieve control, flexibility, and economy of installation and operation. Odorizers now being used with two exceptions are of the by-pass type. The two exceptions mentioned are Sioux City and Waterloo, in which we have the more elaborate and costly automatically controlled equipment. Biggest disadvantage of this type of odorizer is one of economics, due to the fact that our other towns have a customer count that varies from 50 to 2600. We feel that the cost of this more expensive equipment is prohibitive for towns of this size.

The by-pass odorizer lends itself fairly well to our method of operation even though it does have some inherent faults that we are trying to correct. The problem of control and flexibility is manual and is therefore subject to the whims of local personnel. We feel that, with adequate training and checking, this problem is small. The largest problem is one of measurement due to light flows encountered. We are at the present experimenting with a side tank, or day tank, using a float with a magnetic indicator on it to give us a measurement on the amount of liquid used, which until now, has been almost impossible. Odorant distribution in the town is to be spot checked by the use of an "Odorometer." Construction of the odorant tank and piping details is shown in the accompanying illustrations.

District Regulator Stations

Location and size of district regulator stations is generally based on three main items:



Maximum hourly demand. Basically, we allow a maximum flow of 50 Mcf on a large dual regulator set.

Load centers. Regulator stations should be located to feed into large load centers instead of running distribution to serve this area. This is determined by the economics of using smaller high pressure mains over running large distribution pressure mains to serve an area.

Size of regulators used. This is somewhat dependent, of course, on the demand, but with the variety of sizes and kinds of regulators on the market today, one can build a station of almost any size and capacity desired. This last item should be considered because it is sometimes much more advantageous to have several smaller stations with their systems tied together than to have one or two large independent systems.

Regulators used in our stations are of only three types, such as:

1. **Pilot loaded regulator** — 2-in. flanged body, 1⅛-in. orifice, approximate capacity of 25 Mcf with 25 psi inlet and 10 psi outlet.
2. **Pilot loaded regulator,** identical to No. 1, with the exception of 2-in. screwed body.
3. **Self contained regulator** — 2-in. screwed body, ½ in. orifice, approximate capacity of 12 Mcf with 25 psi and 10 psi outlet.

These regulators must be of a type built to withstand the elements without protection, for outside installations.

These district regulator stations are of all welded construction, using flanged valves on the dual sets, and screwed valves on the single regulator sets. Factors affecting the choice between dual or single sets are difficult to pinpoint; essentially, these factors are:

1. A dual station shall be used in all towns with only one station.
2. Use single stations as booster or additional feeds.
3. Small isolated sections may be fed with single station.

Location of the station determines whether or not it is to be an above-the-ground-type, or a pit-type. Almost without exception we attempt to make all stations of the above-the-ground type. Cost and maintenance are greatly reduced on above-ground sets. We have gone so far as to buy a 5-ft by 5-ft piece of ground on which to place one of these stations to keep from digging a pit.

Services

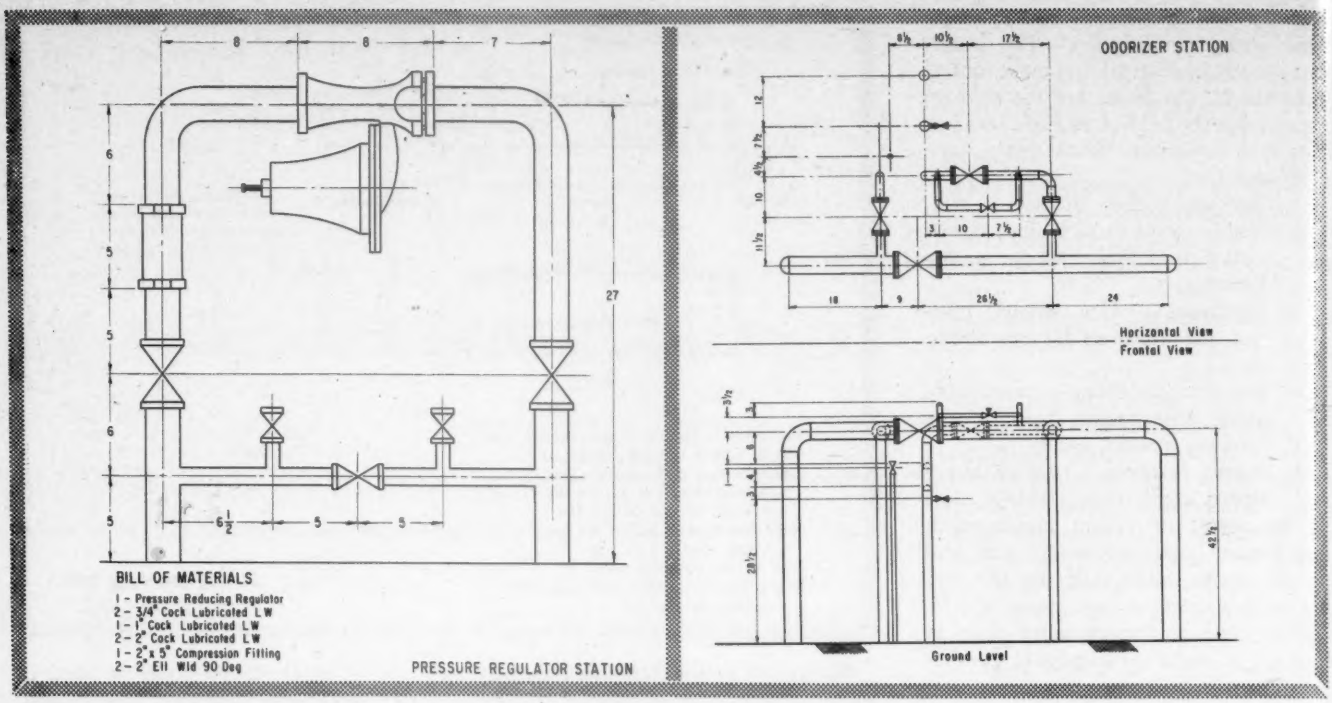
Specifications covering the pipe and coatings for service pipe are the same as those for mains.

We have attempted to standardize as much as possible to reduce inventories and aid in maintenance and service problems. We use only two sizes of services, based on these rules:

1. Any job with a demand of 1000 cu ft per hr or more will take a 2-in. service or larger.
2. Any job with a demand of 500 to 1000 cu ft per hr and a service length of more than 100 ft will take a 2-in. service.
3. All other services will be conconstructed of ¾-in. extra heavy pipe.

Any very large jobs are checked on the flow computer to determine service size as stated in rule No. 1.

Construction of the service is all welded, with the service running to the nearest point of the house to the main. We bring all of the services above ground outside the house with the service cock installed at this point. These cocks are of the tamper-proof, lock-


BILL OF MATERIALS
1 - Pressure Reducing Regulator
2 - 3/4" Cock Lubricated LW
1 - 1" Cock Lubricated LW
2 - 2" Cock Lubricated LW
1 - 2" x 5" Compression Fitting
2 - 2" Ell Wld 90 Deg
PRESSURE REGULATOR STATION
ODORIZER STATION
Horizontal View
Frontal View
Ground Level

wing type. All high-pressure service cocks and all those larger than 1-in. are of the tamper-proof, lock-wing, lubricated type.

Cathodic protection is completed at this point by using insulating fittings:

¾-in. insulating male adapters;

1-in. insulating street elbows (out of the regulator), or

2-in. insulating compression coupling.

We are presently using some insulating meter swivels, but as yet have reached no definite conclusions on these.

Customers Regulators

Most recent change in our construction design has taken place in the area of customer regulators. Up to September 1955, standard customer regulator was a type with an internal relief valve with low capacity relief. At that time we started using a type of regulator with an internal relief valve that has full relief capacities. Principal reason for this change was due to the new "B-31" code, in its respect to venting of regulators and the overpressuring of piping and burners. The type of regulator now used is an effort to meet the requirement of the B-31 Code.

Bodies on the regulators used are as follows:

Domestic	¾ by 1-in.
Commercial	1½ by 1½-in.
Industrial	2 by 2-in.

For high-pressure services, we use a ¾-in. by ¾-in. bodied regulator with an outlet setting of 5 psi and then follow this regulator with standard ¾-in. by 1-in. bodied regulator for the final regulation.

Installation of our regulators is made with the regulator outside of the buildings. We do this with no exceptions on the high pressure or first cut regulator.

Meters

Metering equipment is purchased with the same idea of standardization in mind, as mentioned before, particularly in relation to maintenance problem and parts inventory.

We are using aluminum case meters and are presently using a meter of 250 cu ft per hr capacity for domestic service, which will take care of approximately 95 percent of all installations. For larger commercial or industrial applications we use a 100 psi aluminum case meter that can be used for metering on either distribution or high pressure. In our operations, we allow approximately 25 cu ft per hr for water heating, cooking, and other firm uses from the rated capacity of the meter, thus giving the balance of the meter capacity for space heating requirements.

When a high-pressure case meter is used for metering at pressures over our base pressure of ¼-psi, a correcting device must then be used for correcting the volume of the gas from the elevated pressure to our base pressure. If a customer desires any pressures over the ¼ psi delivery pressure, for reasons of burner rating or piping capacity, the customer is required to purchase and install the regulating equipment for any pressure reduction that he may need.

Meter installations are all made with inside meter sets, with the exception of a few large industrials that are installed outdoors, of screwed construction up to 2-in. size, which are welded. An additional shut-off cock is placed inside on the set to aid in service work and as a safety measure.

Construction Costs

We are quite concerned, as is everyone in the gas industry, with today's high construction costs. Basically, there are two ways to reduce the cost of construction: *Reduction in standards* set up for construction, or *changing the type of construction used.*

None of us are too enthusiastic toward lowering our standards of construction for many reasons such as industry standard requirements, public and workmen safety, and local or state laws. We are then forced to fall back on changing type of construction.

One method of changing type of construction, currently being investigated, is the construction of a distribution system carrying a pressure of from 20 to 25 psi. We have made a comparison of a typical small distribution system, namely the town of Calumet, Iowa, using both 10 psi and 25 psi distribution. The savings comes from using smaller sized mains throughout the distribution system. The projected savings are as follows:

Plant investment, 10 psi system	$27748.00
Plant investment, 25 psi system	24855.00
Savings	$ 2893.00

This savings gives us a 10.45 percent decrease in construction cost.

The problems of design are constantly changing. Who knows what basis we will use 10 years from now?

Acknowledgment

This article was prepared from a presentation made at the 34th annual Midwestern Gas School and Conference, Ames, Iowa, 1957. * * *

American Gas Fundamentals

A Continuing Educational and Refresher Course in Gas Technology, Management, Equipment, Operations, and Utilization

Gas Odorization in Distribution Systems

ODORIZATION of fuel gas is essential whenever the gas is so odor-deficient that leaks from transmission lines, distribution systems, building piping, and appliances cannot be detected by the consumers. The principal sources of natural gas in America produce odor-deficient gas. Consequently, odorization is now a common operation in all regions of this country.

The need to odorize is easily and unmistakably determined by the trend in incidence of customers' leak-complaints. A reduction of odor intensity invariably is reflected in a reduction in the average number of daily leak reports.

Customers in areas formerly distributing straight manufactured gases are accustomed to a powerful gas odor. The average gas company converting from carbureted water gas to natural gas in these areas expects about 20 leak-complaints per 10,000 meters per week.

Continuous odorization of gas in this country began about 1928. In the 1930's some states enacted legislation making odorization mandatory. There was little odorization legislation for the following 20 years, but the middle 1950's have witnessed enactment of laws by some 21 states making it compulsory that fuel gas shall have an odor.

Odorants

Odorants are classified as *dilute* or *concentrated*. Use of the dilute type has declined almost to the point of extinction. Dilute odorant is used at a rate of about 20-lb per million cubic feet of gas, whereas a concentrated odorant is used at a rate of only 1-lb per million cubic feet. (As an approximation, one pound of odorant is equivalent to one pint.)

Dilute odorants, despite their bulkiness, have the advantage of ease of control because the injection rate need not be controlled very precisely. One pound of dilute odorant more or less per million cubic feet of gas makes very little difference in odor intensity; one pound of a concentrated odorant more or less is the difference between no odor and so much odor that there is a costly surge of fictitious leak complaints that really are only pin hole leaks, or delayed-ignition and after-turn-off whiffs of gas.

Dilute odorants are not volatile enough to odorize high-pressure gas. With the advent of higher pressures at the city gate stations, where odorization is usually performed, it became necessary for some gas companies to use concentrated odorants. At the same time, odorization methods and controls have improved so that use of the more convenient concentrated product is now feasible for any volume of gas flow.

Chemicals acceptable to the gas industry as odorants must meet certain physical and chemical specifications. The first of these is odor type, which should suggest or be similar to the odor of manufactured gas. It must not be similar to any household odors.

All commercial odorants are organic sulfur compounds. They are used in such minute quantities that they add only 0.2 grains of sulfur per 100 cu ft of gas. Up to ten times this quantity of organic sulfur is considered below the preferred maximum, and most public utility commissions permit 10 grains per 100 cu ft.

Chemicals used as odorants are liquids having boiling points ranging from 90 to 212 F. They have very low freezing points, −50 F or lower. They are not particularly corrosive, even in the liquid state, to non-copper metals. Aluminum is notably resistant to attack by odorants. Copper and brass should be kept from contact with liquid odorant although cadmium and tin plated brass parts have given good service. It is important to keep odorants free of water, not only to prevent freeze-ups in cold climates, but also to minimize corrosion of odorizer equipment which occurs to some extent in the presence of water.

Where to Odorize

Odorizers are usually placed at city gate stations, on the low side of pressure regulators. This location has the advantage of injecting the odorant into low-pressure gas where the linear velocity is higher than on the high side, so that evaporation and diffusion into the gas stream can more readily occur. Also, at this point the pressure is more likely to be constant.

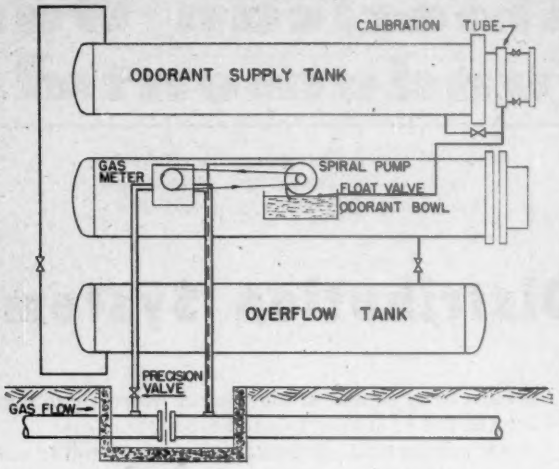
Not many odorization systems have reliable variable pressure compensators, because the need for them is not great; it is usually possible to select a point of constant pressure for odorant injection. Excellent pressure instruments are available, but their use entails what most companies consider an unwarranted expense.

Another and even more important reason for odorizing at the point of constant pressure involves the phenomenon of adsorption. All odorants belong to the class of chemicals that are readily adsorbed.

Pipe scale and dust adsorb odorants to a marked degree. During the period that is necessary to saturate the scale and dust layer, much odorant is removed from the gas. It is common practice to over-odorize a new line or system heavily, so-called "slugging," to reduce the length of time for saturation, and to insure a safe odor level in the distribution system during this break-in period.

If the pressure at the odorizer were to decrease sharply, so much desorption of odorant would occur that the effect would be that of over-odorizing by several hundred percent. If the pressure at the odorizer were to increase, adsorption removal of odorant from the gas stream would resume, and a dangerous odor deficiency would result.

Odorization being a proportioning of odorant to gas



Liquid injection meter type odorizer.

flow, it is operationally related to orifice metering. The same considerations that dictate placement of a meter run, such as freedom from turbulent flow, remain true for location of an odorizer.

Who Does the Odorizing?

Responsibility for maintenance of a safe odor level in a distribution system rests with the distribution utility. The distribution utility may purchase untreated gas from the transmission company, then add enough odorant to meet the safe odor requirement. Or the distribution utility may purchase gas that has been odorized by the transmission utility to the extent required for transmission purposes — generally not as strong as a distribution system needs, since a transmission line rupture is quickly discovered from the noise and the pressure drop that result — and add sufficient odorant to satisfy distribution requirements. Or the delivered gas may have adequate odor for distribution purposes, and the distribution utility has only to police the odor level to make sure that it is adequate at all times, and be ready to odorize on a moment's notice in case the delivered gas suddenly becomes odor deficient.

Odorizers

Equipment for introducing odorant into the gas stream falls into two broad classifications: *Liquid injection odorizers*, and *evaporation or absorption type odorizers*.

Liquid Injection Odorizers

In *liquid injection* equipment liquid odorant flows into the full gas stream, where it evaporates and diffuses into the gas. Injection systems proportion the odorant flow to the gas flow automatically through use of an orifice in the main that produces a pressure differential varying as gas flow varies. This differential directly or indirectly controls the speed of the odorizer.

Many home made odorizers have been used and are still being used, but with commercial equipment of advanced design now available, and with the realization of the importance of accurate proportioning, home made injection odorizers are rapidly being replaced by commercial odorizers. Two types of manufactured injection odorizers have been most widely accepted. They are the meter pump odorizer and the positive displacement chemical feed pump.

Meter Pump Odorizers

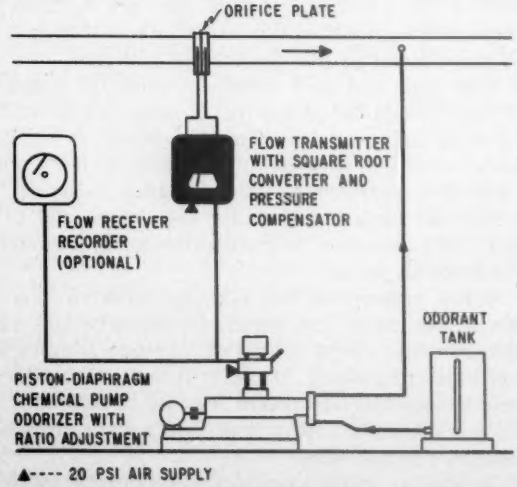
With the *meter or spiral pump* type of odorizer, a differential in the full gas stream is produced by an orifice plate, and an ordinary iron case meter is connected across this differential. The meter shaft is connected by a sprocket chain drive to a hollow shaft having a scoop that dips into a bowl of odorant. The odorant level in the bowl is kept constant by a line from the supply tank and a float valve. The entire mechanism is encased, and operates at line pressure.

As the meter revolves, in perfect proportion to the main gas flow, a positive amount of odorant is picked up by the scoop, and deposited into a compartment with a weir, thence to a conveying tube to the gas stream. The weir produces a smooth feed of odorant rather than a slug each time the scoop lifts. There is a pressure compensating valve that speeds up the meter for an increase in static pressure and slows it down for a decrease in static pressure.

The meter type of odorizer is the most popular commercial design in use. The rate of odorant injection can be varied for a given revolution of the meter by varying the liquid level, and/or by changing the sprocket ratio. There is a wide range of odorant injection rates possible for a single model.

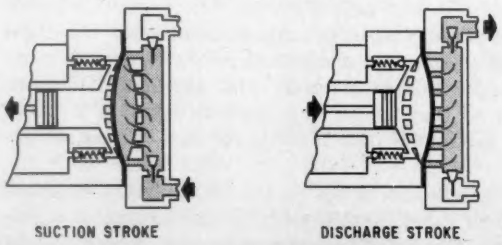
Chemical Feed Pump Odorizers

The most advanced odorizers, in use at an increasing number of high volume odorization stations, are chemical feed pumps. These are very rugged, high-


ORIFICE PLATE
FLOW TRANSMITTER WITH SQUARE ROOT CONVERTER AND PRESSURE COMPENSATOR
FLOW RECEIVER RECORDER (OPTIONAL)
ODORANT TANK
PISTON-DIAPHRAGM CHEMICAL PUMP ODORIZER WITH RATIO ADJUSTMENT
20 PSI AIR SUPPLY

Left, piston-diaphragm chemical pump odorizer with control system.

Below, principle of piston-diaphragm pump.



pressure, precision built, controlled volume units, whose materials of construction are capable of handling highly corrosive fluids.

Several types of chemical feed pumps are being used in odorant service, among them the *piston* type, the *piston-diaphragm*, and the *rotary positive or gear pump*. They can pump against enormous pressures with zero-gage suction.

The piston-diaphragm type has emerged as a favorite for odorant service. The piston pumps odorless oil against the diaphragm on the discharge stroke, forcing odorant on the other side of the diaphragm into the gas stream. The intake stroke of the piston pulls the diaphragm back, opening odorant intake valve and closing odorant discharge valve. Thus, the odorant is isolated from the piston, while at the same time positive piston performance obtains. Odorant leakage does not occur as it does through the packing gland of the straight piston pump. The differential produced by the orifice is the signal that either varies the piston travel per stroke, in the case of constant speed electric motor driven pumps, or varies the motor speed, in the case of constant piston travel.

The control instruments are integrating, i.e., they extract the square root of the product of pressure and differential so that the control signal follows the corrected gas volume flow.

One attempt to avoid need for electric power involves using gas pressure to drive the pump, in a turbine-fashion. The power gas is vented to atmosphere, and as the quantity of gas needed is considerable, the high operating cost has discouraged use of this type.

Absorption or Evaporation By-Pass Odorizers

With the *evaporation by-pass odorizer*, a small proportion of main stream gas is by-passed around an orifice plate or partially closed valve. The by-pass gas, known as "sweep gas," is saturated with odorant when it leaves the tank.

For example, 1000 cu ft of sweep gas saturated with a BP odorant at 150 psi gage and 50 F may contain 0.5 lb of odorant. This is sufficient to odorize 1,000,000 cu ft of gas.

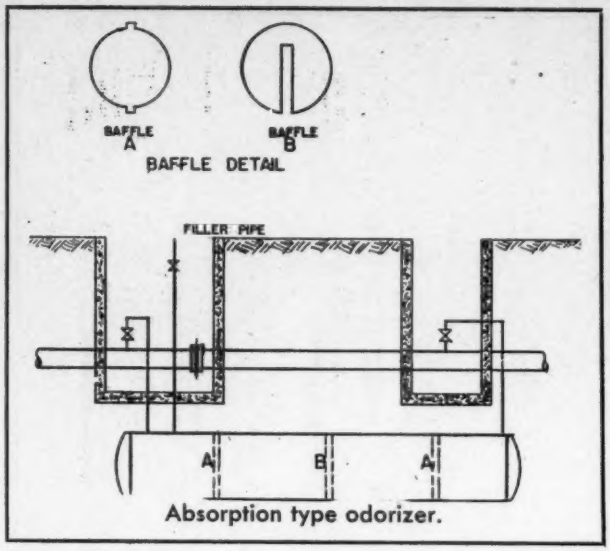
Under these conditions, the sweep gas lines and valves should be designed to pass 1000 cu ft of gas while 999,000 cu ft are going through the main line orifice.

The evaporation by-pass odorizer is very popular with many gas engineers. It can odorize a single service at low distribution pressure, or it can odorize a daily delivery of several million cubic feet at a city gate station. It requires an odorant with uniform evaporation characteristics rather than the wide boiling blends usable in injection odorizers.

The principal factor limiting the quantity of gas that the evaporation by-pass odorizer can handle is the accumulation of heavy, high-boiling liquids in the odorizer. These liquids consist of condensates in the gas as it comes from the well, and/or compressor oils picked up by the gas as it goes through boosters en route to distant markets.

As these *high boilers* accumulate, they decrease the volatility of the odorant, thus reducing odorant pick-up until odorization virtually stops. This action occurs at a rate depending on the amount of condensate, so there is no hard and fast rule for determining the upper limit of gas load that a large by-pass odorizer can odorize. A peak hour of 1.0 to 1.5 MMcf is tops under average conditions.

The odorizing rate of an evaporation by-pass odorizer is also affected drastically by fluctuations in odorant temperature. Temperature variations can be minimized by using a buried tank. In addition, it is customary to adjust the sweep gas flow-control valves seasonally. Other systems make use of thermostatically controlled heating elements, which eliminate the need for underground tanks.



Absorption type odorizer.

The evaporator is usually a horizontal tank. Sweep gas enters close to the high-pressure end and leaves close to the low-pressure end. Odorant pickup is assisted by baffles in the tank that create turbulence. Certain BP odorants have a unique vapor phase character such that a horizontal tank is unnecessary. Ample odorant pickup is effected even when these odorants are used in vertical tanks, where the odorant surface area above the sweep gas is relatively small. Use of a vertical tank permits accurate measurement of odorant consumption, and this is extremely important to many gas companies which have a hundred or more small towns with odorizers. Along with the development of the vertical tank by-pass odorizer came a commercially available unit with a totally enclosed direct reading liquid level gage. A week's consumption of odorant by an odorizer for a few hundred customers can easily be read. The sketch illustrates this design.

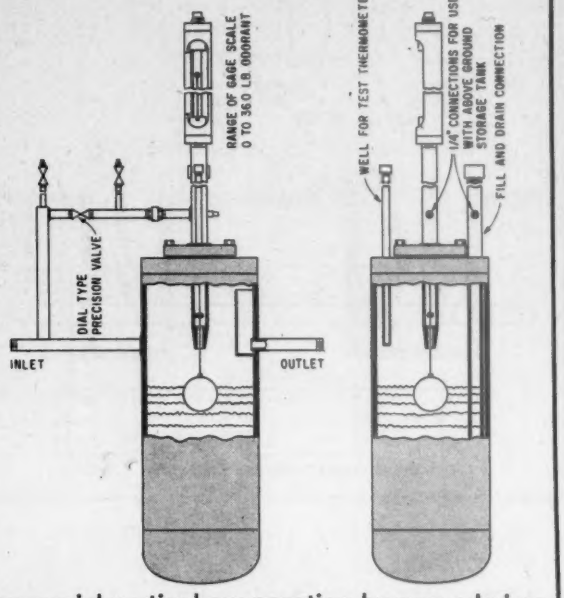
Odorizer Buildings

Even though care be taken that no leaks exist in odorizer installations, few if any odorizers are so perfect that no odor escapes to the adjacent area. Merely filling the odorizer, as needed, releases enough odor to cause some anguish to nearby residents.

Odorizer buildings fall into two classes:

Positive Pressure Type—Those with blowers that maintain a positive pressure on the building and force the contaminated air out through an activated charcoal filter. The building is made as airtight as possible. Before anyone enters the building, the blower is operated long enough to decontaminate the air inside. Then, workers enter, with the blower still running, to adjust and maintain equipment, and transfer odorant from shipping drums to storage tanks. After workers leave the building, the blower is turned off and is not operated again until someone is about to enter the building.

Negative Pressure Type—Here, buildings are equipped with blowers that maintain a negative internal pressure at all times. With the blower operating continuously, the building need not and must not be airtight. Air is drawn from the outside, replacing the



Commercial vertical evaporation by-pass odorizer with liquid level gage.

contaminated inside air which is sent through the blower and then through an activated charcoal filter before being released to the atmosphere.

Odorant suppliers recommend the proper neutralizer for their particular product. The mercaptan odorants can be neutralized with household bleach or potassium permanganate. Dilute acetic acid is recommended for some of the less reactive odorants.

Whenever air contamination by odorant is unavoidable, as for example accidental spillage or odorizer filling, masking agents sprayed toward the odorant emission have proved invaluable. An incident of contamination can cost hundreds of dollars when customers report gas leaks that have to be investigated. Liberal and proper use of the masking agent saves such costs, and public relations as well.

Measuring Odor Intensity

Odor intensity can be lost or reduced by adsorption or oxidation of the odorant by pipeline deposits and scale.

A means for measuring the amount of odorant present at any and every point in the distribution network is very important. While it is true that the leak-complaint reports mentioned previously supply the most significant information about odor intensity, it is necessary to plot the leaks on a system map to know whether the intensity is uniformly distributed.

Even when the locations of the leaks are mapped and appear to be well distributed, odor deficiency at dead ends might be easily overlooked if there are a number of leaks nearby. If odorant is present at dead ends as shown by smell test or gas analysis, it is safe to assume that it is present at intermediate points.

The room test is the oldest of the smell tests. Gas is metered into a room occupied by average observers. When everyone can smell the gas without question, the gas-air ratio is noted. A ratio of one half of one percent is considered quite safe, and as high as one percent is acceptable.

An interesting new instrument admits gas through a mixing valve, which mixes the sample with variable quantities of air. The mixture is sniffed at an opening in the top. Starting with the leanest gas-air ratio, the operator increases the ratio until he can easily detect odor. Then he presses a button that closes the circuit of a built-in hot wire explosimeter. The meter needle indicates what percent gas in air is necessary for detection.

Chemical analysis of the gas is a practical method for tracing odor travel. Chemical reactions that occur only when and to the extent that odorant is present are utilized for detection.

There are legal aspects to having a record of odorization. Often, in the course of public investigations following explosions, the existence of simple records such as reports on odorizer fillings has forestalled charges of negligence against the gas utilities concerned. Some companies secure samples of gas at or near the location of any incident involving gas. The samples are kept in plastic bags that are impermeable and that do not react with or adsorb odorant. Should litigation occur, these samples, properly sealed and witnessed, become useful exhibits for proof of odorization.

Some utilities have adapted chemical laboratory methods of analysis to field use, and the records of these tests are equally suitable evidence that there has been due regard for public safety, with respect to odorization.

Loss of Odorant

It has been observed by many utilities that have changed to oil bath gas scrubbers that odorized gas loses no odorant to the oil. It is desirable, and may be important, to odorize downstream of the oil bath because of the adsorptive effect of dust particles in extremely dusty conditions. This is not necessary with average dust conditions.

Oil fogging has a beneficial effect on odorization when dust conditions are worse than average or when pipe scale removal of odorant persists.

It is an unfortunate characteristic of odorant chemicals that many soils are capable of removing them quite completely from gas. A leak from a main rupture sending gas 50 or 100 ft through soil into a dwelling may be undetected because the odorant molecules have been filtered out by the soil.

Some engineers question whether this holds true for the odor in manufactured gas, as well. A manufactured gas leak filtering through soil and into a building can give warning of its presence, even without odor, through the nausea of carbon monoxide before an explosive concentration is reached.

A similar warning exists for natural gas. A concentration of natural gas in a room, for example two percent gas in air, can signal its presence by formation of aldehydes at burners. These aldehydes are potent eye irritants. They are formed by improper combustion, the result of gas being in the primary and secondary air. Any customer complaint involving eye irritation should be investigated with a combustible gas indicator.

Regional Differences in Odorizing Rate

There are marked differences in odorizing rates throughout the country. In general, companies in the south use a lower rate than those in the north. It is known that the olfactory sense is more acute at higher temperatures. This fact explains why a southern gas company may use only .05-lb of odorant per million cubic feet of gas, and a northern gas company may use a full pound of the same odorant.

This chapter on Gas Odorization was prepared by Walter J. Fitzgerald, Manufacturers Representative — Natural Gas Odorizing, Inc.

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For example, all Rockwell aluminum meters have oil-impregnated powdered bronze bushings at every bearing point. Valves are of lightweight, long wearing Bakelite; diaphragms are costly imported sheepskin (synthetic optional). You'll appreciate the safety of a strong one-piece bowl type body and the single joint construction to minimize leakage risks. Servicing is simplified, too, by an exclusive Rockwell feature that's become almost a trade mark. It's the removable and interchangeable valve plate to which all working parts are attached. Write for bulletin.

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research and development program in company history. A major share of our research is, of course, devoted to our present products and product lines. Such work is conducted in completely staffed and equipped laboratories at every plant level. The aims and objectives of each are guided by a Central Research and Development Center at company headquarters. Pure research is also conducted at this Center and through Fellowships which we maintain at leading institutes and universities.

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Our huge reservoir of technical facilities, talent and experience is dedicated to developing products that will benefit you in the years to come. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

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ROCKWELL GAS METERS AND REGULATORS

CORROSION—What Causes It and How It Happens

Part 3

W. A. Koehler, *Head, Department of Chemical Engineering*
West Virginia University
Morgantown, West Virginia

POLARIZATION

Whenever a current flows through an electrolyte in a cell, chemical changes always take place at the surfaces of the electrodes in contact with the electrolyte. These changes disturb the single electrode potentials at the electrodes and make them different from what they were before the current started to flow. In galvanic cells (this includes corrosion cells) the change at the anode causes its voltage to move downward in the electromotive series and at the cathode the change causes its voltage to move upward in the electromotive series. Therefore, voltages of the two electrodes approach each other and the difference between them is reduced. This change in the voltage is called **polarization.**

We can tell the same story in a different way. Whenever a current flows through an electrolytic cell, it produces chemical changes at the electrodes, and these changes tend to set up a new voltaic cell with a voltage in the **opposite direction** to that of the main cell voltage. This new counter voltage is the polarization. Polarization voltage always opposes the main voltage of the cell, it never reinforces it.

Let us take a closer look at some of the changes that take place at the electrodes when iron corrodes. When iron corrodes the reaction at the anode is

$$Fe - 2e = Fe^{++}$$

That is, the iron ions formed tend to change the voltage at the anode to make it more noble and the greater the concentration of iron ions, the greater the polarization.

At the cathode, the reaction generally is

$$H^{+} + e = H$$

Concentration of hydrogen ions next to the cathode surface becomes reduced because the ions change to gaseous hydrogen and are no longer ions. Whereas, at the anode, polarization is caused by an increase in amount of iron ions at the anodic surface. At the cathode, polarization is caused by a **decrease** in the amount of hydrogen ions at the cathodic surface. Much more important than the change in hydrogen ion concentration is the accumulation of hydrogen gas on the cathodic surface. This has the effect, at least electrolytically, of changing the cathodic surface to a hydrogen surface, which produces a very pronounced back voltage or polarization.

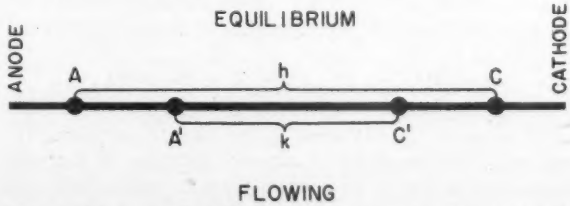


FIG. 8. Diagram illustrates decrease of cell voltage due to polarization.

Polarization can be illustrated as follows with the aid of Fig. 8. The horizontal line represents a voltage scale. Point A represents the voltage at the anode, point C the voltage at the cathode **when no current is flowing** in the cell. The voltage of the cell is the distance between them, represented by **h.** This is called the equilibrium voltage, or equilibrium potential. If a current starts to flow through the cell, the anodic voltage changes to a new position, A', and the change represents the anodic polarization.

Likewise, the cathodic voltage changes to a new position, B' and the change represents cathodic polarization. The voltage of the cell is now represented by **k,** showing a considerable reduction over the original voltage. This reduced voltage drives less current through the cell and, if it is a corrosion cell, the corrosion rate is reduced.

Up to a certain limit, polarization increases with increased current density. This is shown in Fig. 9. In some cases, greatest polarization is at the anode and the curves have the general shape shown in Fig. 10. In other cases, major polarization occurs at the cathode, as illustrated in Fig. 11. This latter is the case when iron corrodes; the hydrogen collecting on the cathodic surfaces causes the greater polarization.

Overvoltage

When iron or steel corrodes with evolution of hydrogen on the cathodic surfaces, there is a definite minimum voltage that the galvanic couple must develop in order to plate out this hydrogen. If there is not sufficient voltage to plate out the hydrogen, the corrosion reaction is stopped. Here an ally comes to the aid of the corrosion engineer.

Some metal surfaces require an additional voltage to make the hydrogen deposit on it. This additional voltage has been termed **overvoltage.** The overvoltage of hydrogen is different for each metal. On platinum it is very low, 0.09 volt; on mercury, it is high, 1.04 volt; overvoltage on iron is 0.40 volt. These values are at very low current densities.

The fact that iron does not corrode in neutral water in the absence of oxygen is attributed to the overvoltage of hydrogen on iron; the voltage of the local

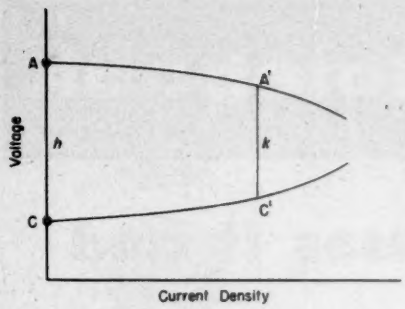


FIG. 9. Polarization increases with current density.

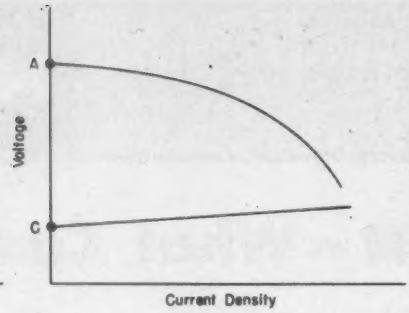


FIG. 10. Anodic polarization is predominant.

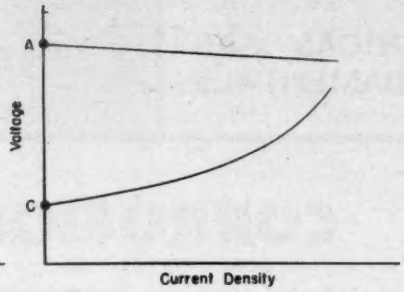


FIG. 11. Cathodic polarization is predominant.

couple is not enough to overcome the polarization plus overvoltage of hydrogen and corrosion does not take place. Polarization and overvoltage are so interrelated that they are frequently treated as one phenomenon.

Overvoltage increases with current density. The overvoltage of hydrogen on iron changes from 0.40 volt at a current density of 1/1000 amp per sq cm to 0.77 volt at 1 amp per sq cm. Therefore, if in a corrosion process the cathodic area is small compared to the anodic area, current density on it will be relatively large, causing a high overvoltage of the hydrogen on the cathodic area. Result may be that the local couple will not have enough voltage to force the hydrogen to plate out. When this is the case, the corrosion reaction at the anode cannot take place either and corrosion is stopped.

In case of corrosion of iron or steel in acid solutions, overvoltage is of little help. The driving force (voltage) of the local couple in an acid environment is high enough so that even the hydrogen overvoltage will not hold back the current. Hydrogen is evolved steadily and corrosion at the anodic area proceeds without interruption.

In a neutral or alkaline environment, however, polarization and the overvoltage produced by the hydrogen is sufficiently great that there is not enough driving voltage left in the corrosion cell to produce a current, and corrosion ceases. This is a situation we like to have, but alas, the forces of corrosion have an ally, **depolarization.**

Depolarization

There are a number of forces that tend to destroy polarization. This process is called depolarization. In the rusting of iron or steel, we have just learned that, in neutral or alkaline waters, the hydrogen accumulation on the cathodic surface can cause enough polarization to stop the corrosion reaction, **if the hydrogen is allowed to remain there.** But here an ally of corrosion, oxygen, tends to prevent any accumulation of hydrogen by combining with it as rapidly as it is formed, producing water. This is represented by the reaction,

$$2H + \tfrac{1}{2}\, O_2 = H_2O$$

Oxygen, therefore, is a **depolarizer.**

ROLE OF OXYGEN IN CORROSION

As a depolarizer. All water in open containers, lakes, rivers, and underground has some oxygen dissolved in it. A thousand parts of water contain approximately eight parts of gaseous oxygen at atmospheric temperatures if the water is in contact with the atmosphere. The oxygen is ready and eager to combine with any hydrogen at cathodic surfaces and change it to water. Then more hydrogen comes out of solution, and it, too, is changed to water, and corrosion proceeds.

This corrosion, however, is at the anodic surfaces. If the cathodic hydrogen is allowed to accumulate, its polarization checks corrosion **at the anodic** surfaces, for if the cathodic process cannot proceed the anodic corrosion process cannot proceed either. In natural waters, the rate of corrosion of iron and steel is almost directly proportional to the oxygen concentration if other factors do not change.

As the oxygen dissolved in the water combines with hydrogen, oxygen is consumed, but if the water is in contact with air, oxygen from the air will enter the water to maintain the oxygen concentration. Therefore, it will continue to depolarize the hydrogen, and corrosion continues. When acting as a hydrogen depolarizer, oxygen promotes corrosion.

If, however, the water is in a closed system as in a hot water heating system, the little oxygen dissolved in the water is soon consumed and corrosion then stops. In such a system there is a little initial corrosion until the oxygen is removed—after which corrosion ceases. Boiler feed water is commonly deaerated in order to reduce corrosion in the feed water heater, the boiler, and the piping.

As a source of passivity. Oxygen in higher concentrations can retard corrosion. It does this by forming invisible protective films on the metal surface. This film can be formed directly by oxygen uniting with some of the metal or it can be formed by oxidizing agents, like nitric acid. If iron is alloyed with chromium or a combination of chromium and nickel (stainless steel) the passivity becomes much more stable than with ordinary carbon steel.

In most cases of iron corrosion, the initial rate of corrosion is much greater than the rate after a short period of time. This is particularly noticeable in solutions containing film-forming agents, such as alkalies and the chromates. Aluminum is a good example on which a film of aluminum oxide protects the metal against corrosion.

As a rust former. When iron goes into solution as ions (when it corrodes) as indicated in Equation 1, ferrous ions are formed. Some of these will combine with hydroxyl ions (OH^-) in the water to form ferrous oxide, $Fe(OH)_2$. This is the black or green deposit next to the corroding metal. On continued exposure to oxygen and moisture this changes to ferric hydroxide, $Fe(OH)_3$.

$$4Fe(OH)_2 + O_2 + 2H_2O = 4Fe(OH)_3$$

Ferric hydroxide is the red rust which forms the outer layer with mixtures of the two in between. In atmospheric corrosion of iron the amount of ferrous hydroxide is small, but when formed underwater or underground the corrosion products often contain a large proportion of ferrous hydroxide. In addition to

the hydroxides of iron, rust commonly contains compounds containing lime, magnesium, and silica.

Products of corrosion can have an important bearing on further corrosion of the metal. These precipitated hydroxides of iron usually carry down some compounds containing lime, magnesia, and silica together with other insoluble materials from the water.

These substances can have considerable influence on the density and structure of the rust coating on the metal surface. If the coating is loose and nonadherent, it may accelerate the rate of corrosion, but a dense, adherent coating may form an effective barrier and reduce the corrosion rate materially.

STRAY CURRENT CORROSION

In street railway operation it is common practice to use a single wire trolley, using the rails as the return path for the current. If there are pipelines underground in the vicinity of the street railway, they may act as an additional return system; some of the return current leaks off the rails and enters the pipes, as shown in Fig. 12. No damage is done to the pipe

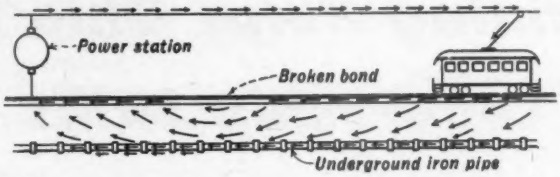


FIG. 12. How stray current from electric railway affects pipe line.

where the current enters it, but if the current leaves the pipe to enter the soil, that area is anodic and the pipe will corrode rapidly.

Such areas are called "hot spots" or "positive areas" by pipeline men, and current causing such corrosion is called "stray current." This current can be hundreds and thousands times as great as current from local corrosion cells and corrosion therefore is very severe.

Stray current is not limited to electric railway systems. Whenever direct current is used, there may be stray current corrosion if proper precautions are not used. It is found in mining areas where a single trolley wire is used for the electric haulage system. Electroplating establishments have been bothered with it; current leaving pipes in wet concrete areas have caused cracking of the concrete due to expansion caused by corrosion products.

Street railway systems have been accused of causing much underground pipe corrosion due to stray currents. But such currents have also been the cause of much cathodic protection of underground pipes. If a good metallic bond is made between the underground pipe and the track at places where hot spots tend to form, stray current corrosion will be eliminated, but at other places in the pipe where the current enters the pipe from the soil the pipes are protected cathodically. There are numerous cases in which corrosion in underground structures became serious after an electric system was abandoned.

CATHODIC PROTECTION

In the above discussion we have been concerned mainly with the causes and mechanism of corrosion. In other chapters in this notebook methods of corrosion prevention will be stressed. Since corrosion is electrochemical in nature, it seems appropriate to mention an electrochemical method for mitigating or even preventing corrosion, namely, cathodic protection.

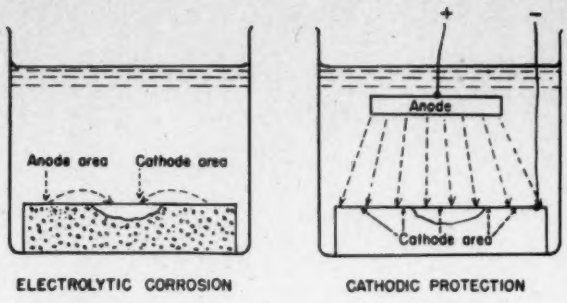


FIG. 13. Diagram illustrates how cathodic protection works.

Corrosion takes place at the anodic areas where the current leaves the structure and enters an electrolyte. In the cathodic area where hydrogen is deposited corrosion does not take place. If, therefore, we can make the whole structure cathodic it should be fairly free of corrosion. This was first tried by Sir Humphrey Davy in 1824, but nearly a hundred years passed before cathodic protection came into general use.

For cathodic protection we need separate anodes so located and arranged that a current from the anodes will flow to all parts of the structure and make them cathodic, as shown in Fig. 13. In the numerous local couples on the surface of the structure, the areas that tend to be anodic will be overpowered, so to speak, from the current from the protective anode, so that they will be cathodic too.

In underground structures, the anode is buried some distance from the structure. An insulated and well-bonded wire conducts the current from the pipe back to the anode, thus making a complete circuit.

If the protective anodes are made of zinc or magnesium, they are self-energizing and supply the voltage to drive the protective current through the soil onto the structure. Anodes, soil moisture, and pipe make a huge galvanic cell that operates spontaneously day and night to protect the pipe.

If the soil between the anode and the structure has a high resistance, these electrodes may not be able to supply sufficient voltage to supply a large enough

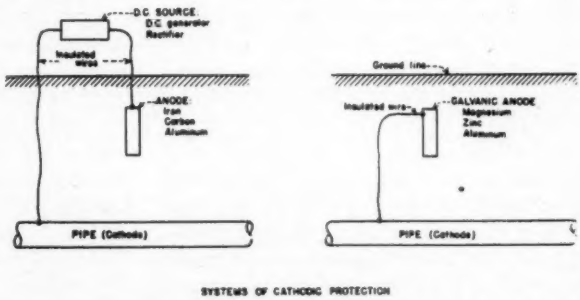
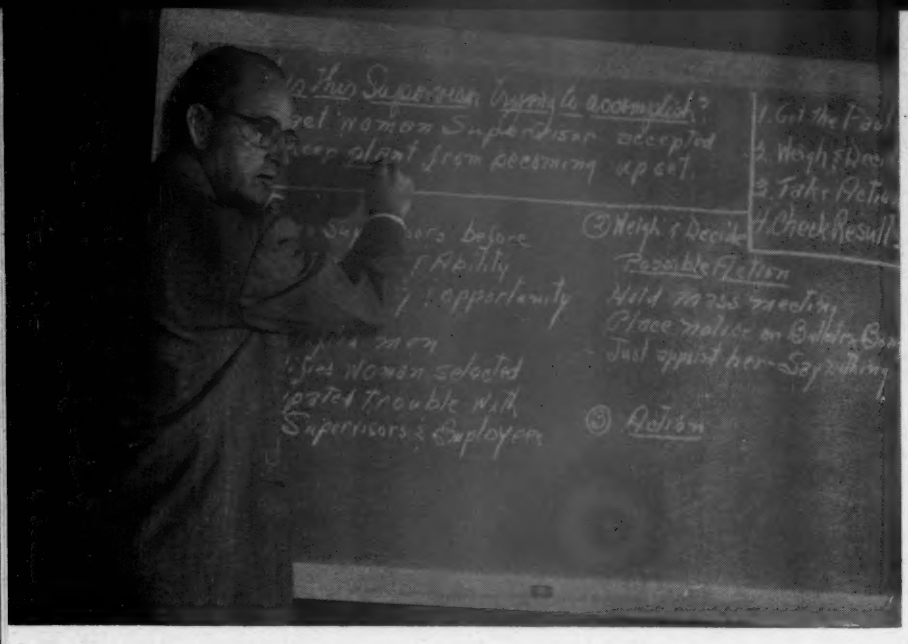


FIG. 14. How cathodic protection is used to protect buried piping, by outside power source (left), and by use of galvanic anodes (right).

current to protect the structure. In such cases, an outside source of voltage is used. This may be a direct current generator, a rectifier feeding from a power line, or even a storage battery. In such cases the more expensive zinc or magnesium anodes are replaced by scrap iron, carbon, or aluminum.

Current required to protect a structure varies with soil conditions and the nature of the structure. In general terms, current densities of 2 to 20 milliamperes per sq ft give proper protection, although in some cases it may be much greater than this. How to determine the proper current to use will be taken up in other sections of this handbook. * * *



Training Director Harold Wise emphasizes a point during one of his human relations classes.

CASE HISTORY:

Human Relations Training Helps Ohio Fuel Supervisors Develop Leadership Skills

Mel Patridge, *Ohio Fuel Gas Company, Columbus, Ohio*

REGARDLESS of how streamlined the methods or how complex the equipment, the backbone of any operation is *people* — working together effectively under supervisory personnel skilled in the techniques of leadership.

Recognizing this, the Ohio Fuel Gas Company has established a course in Human Relations Training for its supervisory personnel. The program is based on material supplied by the College of Education of Ohio State University in Columbus, Ohio.

Human Relations Training is a streamlined intensive program, designed to give operating supervisors practice in developing skill in leading. It is not intended to provide any training in the "knowledge of responsibilities" area. The job of training supervisors in the policies, agreements, and regulations of a particular plant must be done by the plant. It does assume that a supervisor has a knowledge of the work in his department.

Human Relations Training aims to develop a skill — not to give stock answers to personnel questions or problems, or to provide industrial relations background on such subjects as rates of pay, safety, etc.

Because Human Relations Training is focused on working with people, descriptions of what happens to people are the materials for this program. In the standard session outlines, there are problems that are used at specific points for particular reasons. The time of the members of the group is spent mostly on the discussion of their own problems, which they bring in for group discussion.

The 10-hour course consists of five two-hour sessions, during which the fundamentals of problem solving are examined.

Purpose of the first two-hour session is to establish the fact that everyday human relations is one of the most important parts of a supervisor's job; to present foundations for good relations, and to introduce a four-step method of meeting human relations situations — handling problems that arise.

The Four-Step Method is:

1). **Get the Facts** . . . be sure you have the whole story.
2). **Weigh and Decide** . . . don't jump at conclusions.
3). **Take Action** . . . don't pass the buck.
4). **Check Results.**

During the first session — and at the beginning of each of the following sessions — the group leader presents a recording of a human relations problem for group discussion. The problem is a standard human relations situation designed to bring out points in developing a pattern of action.

In studying this problem, the group leader guides the group in "pulling out" positive points that need to be made. Asking where the supervisor "skidded" in solving the particular problem invariably sets up the main points of Human Relations Training's four-step method.

Telling of the "case" problem in the first session is broken into two parts — the actual problem, and then, the obviously poor solution — in order to get emphasis on the importance of starting the four-step pattern at the beginning, and the necessity for getting facts before attempting to make a decision and taking action. The discussion is in the pattern that is followed throughout the conference.

In each presentation, emphasis is placed on the point that the conference is not intended to solve the problem of the conferee. It is designed to set up a pattern to follow — and give practice in developing skill — in solving human relations problems by the four-step method.

In each of the following two-hour sessions, actual human relations problems encountered by each of the members of the conference group are studied.

Here again, no attempt is made to prove the supervisor right or wrong in his handling of the original situation. All discussion is confined to the application of the four-step method of solving the problem.

At the conclusion of each presentation of a human relations problem — approximately 25 minutes is alloted

for each practice conference — the group leader briefly reviews each part of the four-step method, with particular emphasis on points three and four, "Take Action" and "Check Results."

Problems presented by each member of the group are restricted to those that are the supervisor's own job to handle, something he can and must do something about.

At the beginning of the course, each member of a group is given a portfolio cover designed for the course. The portfolio is built-up — sheet by sheet — until it finally becomes a notebook used during the course, and for future reference.

Visual Aids

Flannel board cards are used by the group leader to develop important human relation points of the four-step method in problem solving.

One of the important charts is the one outlining Supervisory Responsibilities. The development of the chart with "People" in the center — and an arrow linking the supervisor to the people — is a quick means of focusing attention on the subject matter of Human Relations Training.

Cards entitled *A Supervisor Gets Results Through People, Foundations for Good Relations* and *People Must Be Treated As Individuals* help further to emphasize important aspects of the pattern for solving human relations problems.

Recognition Given

A "certificate," indicating completion of the course in Human Relations Training, is presented at the conclusion of the last meeting to all members of each group who have attended all sessions and participated in the practice sessions by presenting a "problem" for consideration.

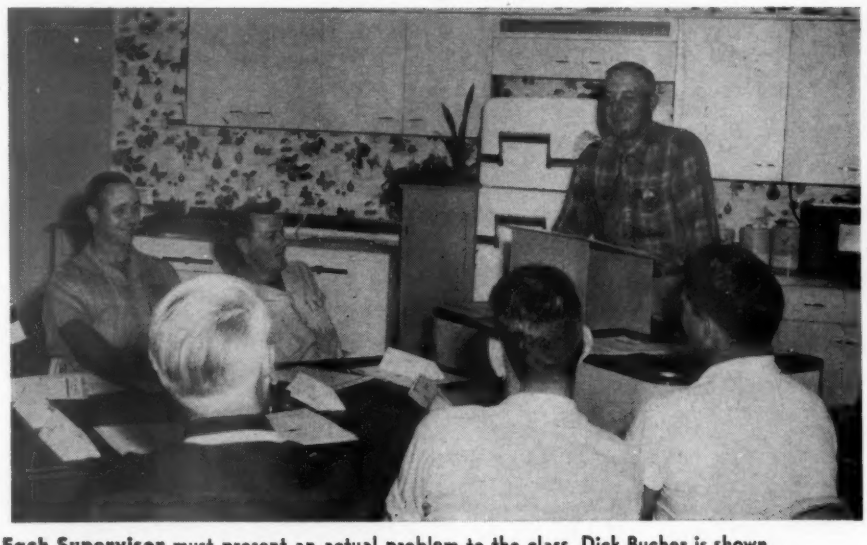
Appropriate records are also placed in each individual's "personnel record" file indicating satisfactory completion of the course.

In addition, each person completing the course is given a copy of Ohio Fuel's Human Relations Training follow-up brochure, which lets the supervisor ask himself, "Am I An Effective Supervisor?"

A supervisor may "score" himself — by using a scorebook provided for that purpose — after he answers the many questions proposed in the brochure. These questions pertain to his everyday relationship with the people whose work he directs.

As a result of a series of 10-hour Human Relations Training courses, Ohio Fuel's management is convinced that its supervisors are now better equipped to satisfactorily solve their own problems. * * *

Visual aids are used to help stress the important points of human relations. This picture was taken during an opening session of the human relations course as Marvin White begins his discussion of the many things that affect an individual on the job. White is the Athens distribution district program leader.



Each Supervisor must present an actual problem to the class. Dick Bucher is shown telling the facts of a problem that he encountered as foreman of the Athens plant. After hearing the problem, the class holds a round table discussion to weigh the facts and decide what courses of action might be taken in meeting that particular human relations situation.

Importance of Human Relations Training was one of the chief topics at a recent meeting of training directors of The Columbia Gas System. Discussing the success of the system's human relations course are (left to right): James Johnson, supervisor of training, Pittsburgh group; Harold E. Wise, director of training, Ohio Fuel; Bernard Kinzer, assistant director of employee relations, Columbia Gas Service Corporation, New York; Warren Barbour, coordinator of employee relations, Columbia Gas Service Corporation, New York, and James Ketcham, training director Charleston Group. Kinzer is chairman of the group.

A 10-Point Supervisory Check-Sheet

Alfred M. Cooper
Consultant

Supervision is a difficult and exacting art; how well do you rate on these questions?

IN 50 years the quality of supervision in shop, field, and office has improved steadily. Yet every survey of employee attitude made today indicates there is still a lot of room for improvement. Most peeves registered by the workers have to do with irritating contacts they have had with some immediate supervisor.

As a check on the quality of his supervision it may prove worth while for any supervisor to study the questions and comments that follow. Each point discussed was suggested by one or more industrial executives of broad experience, and was considered to be important.

1. Can you plan your work ahead?

No supervisor can schedule his time and energies to best advantage until he knows exactly what he is responsible for and has analyzed his job in terms of the relative importance of his responsibilities.

Experience proves that until the supervisor gives real thought to this matter of analysis there is an excellent possibility some of his responsibilities are being slighted, while it is not uncommon to find routine or emergency responsibilities that appear to belong to no one, or which are apparently the responsibility of two or three supervisors.

Such hiatuses or overlapping can be eliminated if each supervisor analyzes his own job and establishes, from experience, a scale of importance for such common responsibilities as getting out production, development of morale, employee physical condition, records and reports, et cetera.

It is, then, not difficult for the supervisor to allot approximately proper time and energy to the discharge of each responsibility, in terms of its importance **in that particular department,** and thereafter know that his planned work schedule will make his supervision both well-balanced and complete. No one but the supervisor can make a proper analysis of his own responsibilities.

2. Are your orders obeyed promptly and fully?

In analyzing their own jobs, supervisors usually are altogether realistic. They agree, for example, that their primary responsibility is that of getting out production. Unless they can meet this obligation, they contend, there is an excellent chance they will be replaced.

Since, in any department, the giving of orders and the manner in which these are carried out has a lot to do with getting out production, a check must be made here.

The speed and effectiveness with which orders are obeyed may indicate the confidence of the worker in his boss. Such confidence can be based only on experience which has demonstrated that the supervisor's orders are likely to be reasonable, are never arbitrary, and may well be obeyed promptly, and as given.

Where subordinates feel justified in questioning any order before carrying it out there is something wrong. This is no time for instruction. For one thing, the time element may well make it impossible to explain why any order has been given, and such explanation should never be an essentiality to prompt action when an order has been issued.

The supervisor who has been having difficulty getting his orders obeyed as given will do well to check the degree of forcefulness with which his oral orders

are issued, and also should determine by a mental check that the who-when-what-where elements of a proper order are either explicit or implicit in the wording of the order.

3. Do you know how to make people do what you want them to do?

Educators call this **motivation,** but it has been practiced in all human relations for ages. Wives are especially good at it. It is the essence of good salesmanship. Its application gets things done smoothly and apparently effortlessly. The ability to apply it distinguishes the leader of men from the driver.

The boss who can make a subordinate's job interesting to him, and who knows how to make that job important in the eyes of the worker, will have little trouble in sufficiently motivating those reporting to him. The boss wants adequate production of good quality, and this is exactly what the subordinate wants to turn out if he is being properly supervised.

A supervisor can make a job interesting by giving credit for good work, by removing unnecessary annoyances, by checking the worker's physical capacities, and by cutting accident rates.

4. Do you know when and how to to deliver an effective reprimand?

Any consideration of supervisory procedure that does not cover the when and how of reprimanding must be wholly unrealistic. Should the day ever come when all orders are carried out promptly as given, then the supervisor can forget about reprimanding.

Until then, he will do well to study his methods of calling attention to oversights in these matters. For years emphasis has been placed on doing all reprimanding in private and most supervisors subscribe to this theory. Yet only recently in a defense plant I heard a foreman shout at a worker, "Hey you! What in hell do you think you're doing?" That sounded a bit like a public reprimand.

The objective will be to make the reprimand sufficiently effective with each individual that it will be a long time before another one is called for.

Experienced executives contend that the reprimand must be fitted to the individual; that a few words will suffice with an intelligent subordinate, but more time and effort must be devoted to the obtuse or stubborn worker. The desideratum here is that, when the reprimand has been completed, the worker knows exactly why he has been corrected, holds no resentment, but feels inclined to avoid further errors in the future. Thereafter there must be no carryover of censorious attitude on the part of the supervisor.

"Soft supervision," of the sort that is practiced by those who believe reprimands are never called for, is ineffective, costly supervision. When consistently practiced it places a premium on sloppy workmanship and develops a curious type of prima donna subordinate — a person something like the "little monsters" we see among the children of parents who refuse to correct their progeny for fear of inflicting a "psychic wound."

A supervisor should never be put in the position of being shorn of too much of his rightful authority, for then he must attempt to get results by wheedling, wasteful, roundabout methods of persuasion in which polite suggestions must replace result-getting orders.

5. How much responsibility are you willing to assume if a subordinate of yours is injured on the job?

In this matter of the supervisor's responsibility for injury there is, of course, no set rule to determine when the boss is at fault.

The important thing here is not the technical degree of responsibility for accident prevention that may be assigned to the foreman, but rather the readiness of the supervisor to shoulder such responsibility. If accidents were desirable there would be no problem here, but a supervisor may be censured for having too many occur in his department.

The foreman who accepts responsibility for accident prevention demonstrates genuine awareness of his unique on-the-job relationship with his subordinates, wherein he can combine daily safety instruction with routine production supervision. It is better for management to absolve the supervisor of all blame for an accident than for the foreman to assert his lack of culpability.

6. Do you consider your brother-supervisors to be high-grade men?

It is not reasonable to expect any supervisor to entertain a high opinion of all his brother supervisors. But in the average industrial organization a majority of the supervisors should measure up to certain minimum standards in the qualities of supervision we are considering.

Therefore, if the supervisor gives all his fellow-bosses blanket high praise he probably is not being altogether sincere. In the give-and-take of production supervision it is inevitable that some friction will develop, and this must in some degree color the opinions supervisors entertain toward one another.

But even worse than such evasion is the situation, occasionally encountered, in which a foreman may speak disparagingly of all, or nearly all, of his brother-foremen. Such a boss has a real problem to work out in learning to cooperate with men of equal rank. In some instances the fact that a group of foremen are in competition for the job may lead a short-sighted individual to take a dim view when evaluating his brother-supervisors.

It might appear that the boss who got along well with his own subordinates would also cooperate well with supervisors of equal rank. But it sometimes develops that a particular supervisor has a natural penchant for developing a group of subordinates who are fanatically loyal to him, yet who cooperate poorly with the employees of other departments. The foreman of such a tight-knit group usually encourages this insularity and clannishness, and may set the example by cooperating poorly with other foremen.

Most foremen like most of their fellow-foremen and are determined to get along with the remainder of the supervisory force.

7. Are you satisfied with the rapidity with which you have been promoted?

This is not a trick question, but it is one that cannot be satisfactorily answered without thought.

In exceptional instances a supervisor may have been so fortunate as to have been shoved rapidly ahead, and in this case a flatly affirmative reply would be in order.

In most cases, however, promotion to worthwhile supervisory jobs come rather slowly, and this is perhaps a good thing. It takes time to learn how to supervise people and the process cannot be much hurried. Whenever this has been attempted the results have not been satisfactory. Apparently there is no adequate substitute for experience — years of it.

Most supervisors would like to see promotions come oftener, yet unless others are being advanced over their heads they do not feel too strongly about the matter. They believe if they do a good job they will not be overlooked when a better job is open, and in the meantime running their departments is sufficiently interesting and demanding work.

Thus it may be said that the supervisor who is wholly satisfied with his rate

of advancement, and the one who is thoroughly dissatisfied with the frequency of promotions, each may need to give a bit more thought to this matter of getting ahead.

8. Do you know when and how to delegate authority to others?

In a minor supervisory job the boss may get by for years without finding it necessary to trust others with authority. But unless he eventually learns to delegate authority, and when and how much, he definitely limits his own chances for advancement. Once executive rank is reached this matter of delegation must be studied carefully, in order to ascertain the load any assistant may safely be expected to carry.

Delegation should be practiced as early as possible, if for no other reason than that management often hesitates to promote a supervisor who has failed to develop a good second man. The only way to properly teach an assistant how to run a department is to delegate to him sufficient authority to run it, whenever this is possible.

Since the supervisor can delegate only authority to an assistant, but must continue to be forever responsible for any errors the second man may make, it calls for a certain steadfastness in the makeup of the boss before he can trust not only a subordinate with authority, but as well his own judgment as a picker of men who may safely be entrusted with authority.

Of course, not all assistants are equally capable of accepting authority, and the boss will do well to study these lieutenants and delegate to them according to their ability in this department. With some he will be able to go all the way in delegating; with others he will find it advisable to go slow after he feels that the assistant has about reached his limit in this respect.

9. Are you a good teacher?

In every industrial organization we find one or more executives or supervisors who have acquired enviable reputations as developers of men. Throughout the plant, service in such a department is considered as something special in the experience record of any employee, and these people are always in demand, in other departments, and as supervisors.

The head of such a department is unusually proficient as a teacher. Any knowledge or skill he has acquired over a period of years he can readily impart to others, and in such manner that the teaching job does not have to be repeated. And he takes genuine pleasure in doing this.

Such a supervisor or executive has given thought to the proper sequence of operations in the teaching process, and it will be found he has the following criteria in mind when he evaluates the job he is doing in imparting information on any subject to a subordinate.

(a) He ascertains the limits of the learner's previous knowledge of the subject, or on related subjects, and thus bases his instruction on something the employee already knows. Failure to take this preliminary precaution accounts for most of the serious breakdowns in industrial teaching.

(b) He puts over his new ideas in an instructional order, according to a scale of difficulty based on his knowledge of the subject, rather than in a conventional production sequence, in which the most difficult lesson might well be taught at the outset.

(c) He breaks up the material to be taught into small lessons, so that the learner has little difficulty grasping the new ideas in each lesson. Teaching, or attempting to teach, too much in one lesson is another common error of the untrained industrial teacher.

(d) He gives the subordinate plenty of time to try out the new ideas in practice before expecting proficiency, but eventually insists that the learner can demonstrate that he has actually mastered each lesson. He does all these things so smoothly that the subordinate is unaware that his superior is consciously employing the best teaching technique.

(e) Above all, this unusual developer of men has succeeded in mentally placing himself in the place of the learner, and thus can properly plan lessons and make allowance for the difficulties facing the employee who must now grasp many ideas that are altogether new to him. Such a teacher is a valuable man in any organization.

10. Can you defend a policy laid down by management even when you have not been informed of the reason for this ruling?

Any group of experienced executives rates loyalty as one of the essential eight among the qualities of leadership. Loyalty in the case of the supervisor is a measure of the confidence he has in his superior and in his management. If he feels their decisions have in the past been uniformly fair, in terms of the welfare both of the employees and the stockholders, he can wholeheartedly support any policy so laid down even though, in any instance, he has no idea why it was formulated.

This is true even when, on its face, the pronouncement appears to differ sharply from earlier action on the part of management.

The supervisor who feels he must determine for himself in each instance whether or not he favors, and can conscientiously support, a policy of management that has not been explained to him, is probably working for the wrong company.

The only kind of loyalty that is worth much when the going is rough is what is usually termed "blind" loyalty. This is true, since, as in the case of orders issued by the foreman, the time element may make it impracticable in an emergency that everyone affected be informed of the reasons behind an order before it is to be adhered to. Furthermore, the supervisor, even though himself in the dark, must nevertheless be able to sell the new policy to his subordinates, and do this convincingly.

In the foregoing we have discussed briefly 10 major divisions of supervisory responsibility. These are:

(1) Ability to plan work,

(2) Ability to command respect,

(3) Ability to motivate others,

(4) Effective control of group,

(5) Voluntary assumption of responsibility,

(6) Cooperation,

(7) Personal ambition,

(8) Delegation of authority,

(9) Developing subordinates, and

(10) Loyalty.

Supervision is a difficult and exacting art and it is well to bear in mind that perfection in human relationships is something unknown. Thus, if the supervisor were to score himself in each of the phases of supervision listed above, certainly there would be no perfect scores.

Averaging just above 70 in these 10 factors might appear to be a mediocre showing. Actually, this would not be a bad score. The supervisor who can conscientiously give himself an average of 70 on these 10 factors probably is a very good boss. * * *

What Does It Cost To Produce Peak Shaving and Substitute Gases?

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AT SOME FUTURE DATE, the production of natural gas will reach the maximum of the production curve. While this may not be soon, the gas utility industry is planning on what to do to substitute for natural gas when the supply begins to decline.

To know what to do, the suppliers and distributors must determine the capital and operating costs of all substitute gases. Many utilities are now reducing the purchases of natural gas by shaving the load peaks with substitute gas. This is done principally for three reasons:

1) Cost of natural gas purchased by distributing companies relates to the annual load factor. Load factor for this purpose is defined as total annual purchases divided by the maximum daily purchase multiplied by the number of days in the year. The higher the percentage load factor, the lower the unit cost of purchased gas. Peak shaving with substitute gas usually results in a higher load factor and lower cost of natural gas, and lower cost of total gas produced and purchased;

2) Peak shaving helps the transmission companies operate closer to a 100 percent load factor on their line operations. (It should be pointed out, however, that for distribution companies the buying of natural gas at 100 percent load factor is not necessarily the most economical; the weighing of the cost of manufactured gas with the cost of purchased gas could result in the purchase of natural gas at less than 100 percent load factor to be the most economical overall cost of gas.)

3) Peak shaving gives the utilities at least some of the operating experience necessary to ultimately provide substitute gas and, therefore, make the road easier in the future.

Operating costs of peak shaving or substitute gas have been developed in research and in practice. This article discusses operating costs experienced, but refrains from delving in operating costs of substitute gas processes in the pilot plant stages or those untried commercially. Discussion is largely limited to operating costs experienced by New England companies.

Accounting of Costs

Regulated utility companies operate under a classification of accounts prescribed by the state regulatory body or those prescribed by the Federal Power Commission. One group of New England companies has devised means of determining actual costs for peak shaving or substitute gas by sub-dividing the classified production accounts into four categories.

Standby costs

Peak shaving costs

Substitute gas costs

Natural gas costs.

Standby costs are defined as those costs that would be incurred without regard to whether or not the gas production equipment is operated to produce gas for peaking or substitute gas.

Peak shaving costs are defined as the added costs incurred in operating production equipment when actually producing peak shaving gas plus any additional charges for maintaining sets and auxiliaries due to producing peak shaving gas.

Substitute gas costs are defined as the total costs incurred when operating gas making facilities to produce gas upon loss of the supply of natural. In such an instance, amounts charged to these accounts should be all of the costs incurred during such period of operation (including standby costs).

Natural gas costs are defined as the costs incurred in receiving, dispatching, modifying and odorizing natural gas and the cost of gas purchased.

These costs are determined daily by labor time sheets, material invoices and other charges in the same manner as all the other operating expense accounts of the company. Expense statements are prepared monthly.

As an example, Table 1 shows an expense breakdown of just a *labor account* for one of the companies for the month of January.

All of the other expenses such as fuel, purification, supplies, maintenance are broken down in the same manner. In January there were no substitute gas costs.

A summary of operating costs for the year 1956 so accumulated for two companies are shown in Table 2.

As may be seen, Company B only operated its plant for test run purposes and the unit cost per Mcf made in this case is of no significance. Company B also incurred extraordinary holder maintenance that ordinarily is necessary only once every 10 to 15 years. Deducting this extra maintenance expense, the standby cost for Company B would have been slightly less than 9 cents per Mcf purchased.

The figures to keep in mind are

1) for either company to maintain standby added about 8 to 9 cents to the cost of purchased gas;

2) for Company A, the cost of purchased gas plus standby was only 3 cents less than the cost of peak shaving with oil gas.

Cost of High Btu Oil Gas

Most New England companies pro-

ducing high Btu oil gas are using water gas sets converted to high Btu oil gas, either 2, 3, or 4-shell. They are cyclic operations — have tar and liquid recovery problems — and produce a gas that is diluted with combustion products. The gas has a heat value of around 1040 Btu and is interchangeable with natural up to certain limits — possibly 40 to 50 percent. The limitation of interchangeability is a subject in itself. It is sufficient to say here that the problem is recognized and that methods for eliminating the limitation by hydrogenation and otherwise are known.

The actual unit cost of making high Btu oil gas for the month of January 1957 for two New England companies is shown in Table 3.

The figures for Company B are a good indication of the higher manufacturing costs when using light oil. Actually, the plant load factor in January was poor. The 16,329 Mcf make for Company A covered a nine day make period and in total just about equalled the company's maximum day sendout for only one day.

As shown in Table 2, Company A had an average cost of peak shaving for the year 1956 of 73 cents compared with this January of 68 cents.

A company having a plant load factor of 6000 Mcf per day for 30 consecutive days would, in my opinion, result in a cost of around 65 cents per Mcf rather than 68 cents.

As further evidence of this, Hall Henry, president of NEGEA Service Corporation, presented a study of 12 months' operating results in 1953 of this same Company A. These results are shown in Table 4.

Now, if we adjusted the 68.1 cents for today's price of oil, labor, and other costs to those shown in the previous table, today's equivalent production cost would be just about the same— 68.5 cents per million Btu.

The reason is that today's additional tar credit offsets the increase in cost of oil, labor and supplies. Whereas, a few years ago, one could receive only about 7 cents per gal for tar—the present market is around 11 cents per gal. The Federal and State road building programs will undoubtedly aid in maintaining a fairly strong market value for the by-product tar in the future. We know a little more of the technical know-how today than we did in 1953; that is why a 65-cent cost on today's New England prices, given a reasonable load factor, is estimated for high Btu oil gas made from heavy oil.

Labor Force for High Btu Oil Gas

Of interest is an outline of labor force required for high Btu oil gas operation. We will take an actual case. A

TABLE 1. Company A — Month of January, 1957.

Account Number	Oil Gas Operation	Standby	Peaking	Substitute
700.01.01	Supervision and eng.—labor	$ 840	$ 202	—
700.06.01	Oil gas generating labor	299	1071	—
700.10.51	Purification labor	—	1025	—
700.12.01	Misc. production labor	1975	—	—
700.31.51	Storage facilities labor	—	19	—
700.91.00	Undistributed labor	1533	—	—
	Total Excl. Fuel and Residual Labor	$4647	$2317	—

TABLE 2. Operating Costs — Year 1956.

		Company A	Company B
Purchased gas—Mcf		2,422,000	6,753,600
Peak Shaving—Mcf			
from transmission company		8,900	277,900
by manufacturing—oil gas		21,300	2,300
propane		500	700
Total		2,452,700	7,034,500
Unit Cost per Mcf			
Purchased gas		61.82¢	51.65¢
Standby expenses		8.61	11.27
Total		70.43¢	62.92¢
Peak Shaving			
Transmission company		52.60¢	52.60-66.90¢
Oil gas		73.46¢	$6.84
Propane		$2.56	$8.46
Gas Equivalent 1000 Btu/cu ft			
Standby Expenses			
Company A	$208,000		
Company B	$761,000		

TABLE 3. Cost of Oil Gas Manufacturing. January, 1957.

Unit Cost per Mcf (1000 Btu/cu ft)	Company A	Company B
Heat oil	$0.121	$0.105
Make oil	.834	1.285
Steam	.079	.090
Electricity	.021	—
Subtotal	1.055	1.480
Steam credit	—	.010
Tar credit	.507	.231
Light Oil credit	.032	.047
Total FOTS	.516	1.192
Labor	.140	.120
Misc. supplies	.006	.014
Maintenance	.014	.053
Total operating costs	.676	1.379
Mcf made	16.329	22.894
Btu	1.015	1.025
Gravity	.88	.78
Oil used—make	Heavy	Light
Price Oil per gal	6.33¢	12.01¢
Steam cost per M lb	$0.79	$0.90
Labor rate per hr	$2.17	$2.20
Tar price per gal	11.0¢	11.0¢

TABLE 4.

	Company A	
	1953	Adjusted to 1957 prices
Cost Gas Produced/Mcf		
Heat oil	$0.055	$0.063
Make oil	0.710	0.896
Steam and electric	0.071	0.071
Subtotal	$0.836	$1.030
Tar credit	0.274	0.484
Light Oil credit	.098	.098
Total FOTS	0.464	0.448
Labor	0.086	0.094
Misc. supplies	0.044	.048
Maintenance	0.087	.095
Total operating costs	$0.681	$0.685

company in New England has 16,000 Mcf per day oil gas capacity for standby and peak shaving, comprising:

Two—3 shell twin generator sets
One—2 shell inverted U
One—4 shell regenerative set.

The labor force consists of the following:

1—production superintendent
4—foremen
4—gas makers
6—maintenance men (also can be used as gas makers'-helpers)
3—laborers
1—dripman
2—compressor and exhauster operators
1—machinist
1—clerk
1—chemist

Total 24

Annual payroll costs at an average rate of $2 per hour plus 20 percent for fringe benefits, insurance, etc., amounted to $120,000. If this company were to operate 365 days per year at near full capacity more men would be required. For standby and peak shaving purposes, however, the present personnel is adequate.

The labor requirement given above is an actual situation. No two companies would have the same conditions. Each company would have to determine its own requirements depending upon plant layout, set capacities, gas pressure requirements and all the other factors entering into such determination.

Other Common Processes Used by Companies

Other than high Btu oil gas a common substitute gas is propane. Either propane-air mixture or reformed propane.

The raw material used, of course, is liquid propane. Common practice is to vaporize the propane and mix with air to produce a gas of about 1300 Btu, that, in that range of heat value, can be interchanged in substantial volumes with natural gas of 1000 Btu. This is a fairly expensive substitute for natural as you are sending out a gas of 1300 Btu. Ordinarily, the distributing company is not paid by its customers for the extra 300 Btu in the gas.

Propane in New England costs 12 to 13 cents per gal. Since only about 73 cu ft of interchangeable gas is made per gallon of propane (using a 1300 Btu sendout) the cost per Mcf is in the neighborhood of $1.64. When the peak shaving block is small, the economics of peak shaving with propane-air is sometimes favorable. Furthermore, for standby and emergency loss of natural gas, the capital costs for a propane-air plant are far less than for an oil gas plant.

The Long Island Lighting Company initiated the use of a continuous catalytic cracking process developed by Surface Combustion Company. *(A paper on the catalytic cracking process was presented by S. W. Horsfield before the Technical Section at the 1948 Convention of the American Gas Association.)* Originally, the process was used for the production of 537 Btu gas using propane. Recently, one of the two Long Island plants is operating to produce 1000 Btu gas interchangeable with natural. Propane is catalytically reformed to a 285 Btu gas and enriched to produce a finished gas of 1000 Btu.

Table 5 shows the material, quantities, and costs for propane operation.

Possibly, the greatest advantage of this type of plant is that it lends itself to the ultimate in automatic control. Consequently, labor costs may be exceedingly low with only two men per shift. Feed stocks of natural gas as well as propane, butane, refining gas, and natural gas may be used.

Surface Combustion Company has developed a new continuous cracking process known as the TPC oil-gas process. TPC stands for Thermofor Pyrolytic Cracking which is different from catalytic cracking. Operating results of a pilot plant at Toledo indicate a lower operating cost level than the typical high Btu oil gas plant. AGA published a report on this process in April 1956, entitled "Gas Operations Research Bulletin No. 7," which compares in rather complete detail its estimated operating costs with those of present conventional sets.

Capital Costs for Standby

Mentioned previously was the statement that, with the introduction of natural gas, many companies in New England converted their carbureted water gas sets to high Btu oil gas for the purpose of providing standby and peak shaving gas. What are these costs? Table 6 shows the total gas standby investment of two companies in New England that provided 100 percent standby by converting existing water gas sets and adding small amount of propane-air capacity.

Of significance is that this is a practical demonstration of actual costs of providing standby. Company A has total investment of $114 per Mcf daily standby capacity which on the basis of carrying charge of 16 percent on investment produces a capital cost of 18 cents per Mcf annual sendout; Company B shows $154 and 14 cents respectively.

Capital cost of the production equipment at the Glenwood Landing Plant in Long Island, for which the operating costs were shown, amounted to $107 per Mcf daily capacity. The capital costs included cracking furnaces, buildings, waste heat boilers, blowers, pumps and all other accessory equipment (including complete automatic controls) but excluding the land, propane storage and gas storage equipment.

TABLE 5. Glenwood Landing Plant — Operating Cost.

	MCF	Cents/Mcf
Reaction feed stock	2.0 gal propane @ 13¢/gal	26.0
Enriching feed stock	8.7 gal propane	113.1
Cracking furnace fuel	0.5 gal oil @ 11¢/gal	5.5
Labor		1.0
Maintenance		1.0
Electric and miscellaneous		0.5
		147.1

TABLE 6. Capital Costs for Standby.

Company A	
Gas standby investment	$2,812,000
Peak daily standby capacity 1000 Btu/cu ft using light oil and propane (Mcf)	24,700
Investment per Mcf standby capacity 74% high Btu oil gas, 15% propane-air	$114
Investment per Mcf annual sendout	$1.15
Carrying charge at 16% of investment per Mcf annual sendout	$0.18
Company B	
Gas standby investment	$6,230,000
Peak daily standby capacity 1000 Btu/cu ft using light oil and propane (Mcf)	40,590
Investment per Mcf standby capacity 72% high Btu oil gas, 18% propane-air	$154
Investment per Mcf annual sendout	$0.90
Carrying charge at 16% of investment per Mcf annual sendout	$0.14

Some New Capital Costs

A study of investment costs for completely new high Btu oil gas plants has been prepared for the industry by the AGA Operating Section, Manufactured Gas Production Planning Subcommittee, and included in a paper by G. W. Carroll of Philadelphia Electric Company distributed at the May 1957 Production Conference. There is quite a variation in the individual estimates, probably resulting from the different engineering approaches as to the type and size of equipment and amount of spare equipment included.

To give you an idea of costs, let's take the average of three individual builder's estimates.

It costs $275 per Mcf daily capacity for a 20,000 Mcf per day light oil plant and $365 for a heavy oil plant. Double the size and the figures are $220 for light oil plant and $270 for a heavy oil plant.

Now, for propane-air plants, we have developed a cost of $100 per Mcf for a 20,000 Mcf per day low pressure plant with 10-day propane supply. Costs will vary for a plant of this size, depending upon the amount of tank supply necessary and the gas pressure requirements. The range may be as low as $40 per Mcf to $150 per Mcf daily capacity.

What Might Be Installed?

The question of "what might be installed" requires a detailed study of an area's degree day history. Such a study would show the frequency of the maximum degree days. For example, if 63 DD was the maximum daily degree days recorded for a certain area in a twenty-year period and the degree days from 57 to 63 occurred only six days a year, the extra cubic feet of gas needed for this six-day period might be provided more economically by propane-air gas. That is, the company's capital costs plus operation expenses for propane might be less than those for oil gas.

The formula might be:

When:

$I_1 \times R + O_1 \times Z > I_2 + R + O_2 \times Z$

then investment I_2 is installed to provide Z.

Where:

- I_1 = Oil gas capital investment.
- I_2 = Propane-air capital investment.
- R = Required carrying charges on investment in percent.
- O_1 = Operating expense per Mcf made oil gas.
- O_2 = Operating expense per Mcf made propane-air gas.
- Z = Extra Mcf of gas required in extreme peak degree day block.

Capital investment therefore might be a combination of oil and gas and propane-air.

Annual Fixed Operating Charges, High Btu Gas Plants

The AGA Operating Section, Manufactured Gas Production Planning Subcommittee has prepared figures of annual fixed operating charges for high Btu gas plants. Table 7 presents these figures.

There is a reasonable correlation between the annual costs shown for a plant of 20,000 Mcf per day and the actual costs for standby of Company A shown in Table 2 of $208,000. Company A has 18,300 Mcf oil gas capacity using light oil, but the $208,000, includes some costs for propane-air standby.

Full details on the development of the costs in Table 8 may be obtained by reference to the paper by Carroll distributed at the May 1957 AGA meeting. In this paper, labor was included at the rate of $3 per hour, and maintenance at one percent of investment.

Economic Calculations, Natural Gas Plus Peak Shaving

H. M. Henry, president of NEGEA Service Corporation, presented a paper at the AGA meeting in May 1952 on the "Economics of Peak Shaving." I have used his method of calculation of such economics in an example to show operating costs comparison of peak shaving against no peak shaving.

Assumptions

Annual gas requirement	3,961,000 Mcf
Peak day sendout	27,428 Mcf
Cost of natural gas	$4.50/Mcf per month demand $57.00/Mcf per year 31.5¢/Mcf commodity
Cost of peak shaving	75c per Mcf
Annual degree days	6000
Base gas requirements	5000 Mcf per day
Heating requirements per degree day	356 Mcf
Maximum degree day	63

Using a simplified version of Henry's formula for this example,

$$U = \frac{f_p}{L} + H$$

and tables of degree day levels and values of "L," we find that the economic point of peak shaving is a 21-degree day.

In Henry's formula:

- U = Cost per Mcf of peak shaving gas.
- f_p = Annual demand charge per Mcf natural gas.
- H = Commodity charge per Mcf natural gas.
- L = Value per degree day segment at which peak shaving is economical.

Results of the calculations for the cost of gas in this example are as follows:

Without peak shaving	$2,811,111
With peak shaving	2,198,880
Savings by peak shaving	$ 612,231
Cost of gas without peak shaving	70.97¢/Mcf
Cost of gas with peak shaving	55.51¢
Savings	15.46¢/Mcf

For complete calculations reference is made to Tables 8 and 9.

Research

We have seen that the cost of natural gas today in New England is less, but not a great deal less than the cost of manufactured gas. We have seen that peak shaving reduces the total cost of gas. We have seen that 100 percent standby operating costs add about 8 to 9 cents to the total cost of gas.

Transmission companies will undoubtedly look to substitute gas for transportation through their pipelines to the markets at some future date when natural gas supplies begin to dwindle.

These are some of the more obvious reasons why research in gas production is not only desirable but necessary for the welfare of the nation and the transmission and distribution companies as well.

TABLE 7. Annual Fixed Operating Charges
High Btu Gas Plants
Light Gas Oil

Size of Plant Mcf/Day	20,000	40,000	100,000
Working capital	$ 16,800	$ 33,600	$ 88,400
Labor & supervision	126,000	168,000	262,000
Maintenance material	55,000	88,000	170,000
Testing material	2,400	4,800	12,000
Total	$200,200	$294,400	$532,400
	Bunker C Oil		
Size of Plant Mcf/Day	20,000	40,000	100,000
Working capital	$ 18,800	$ 37,600	$ 94,000
Labor & supervision	157,600	210,000	327,000
Maintenance material	73,000	108,000	208,000
Testing material	1,200	2,400	6,000
Total	$250,600	$358,000	$635,000

Other Gas Manufacturing Processes

One recently developed process of producing high Btu oil gas is through the cyclic catalytic cracking of heavy oil by the CCR process of United Gas Improvement Company. The UGI cyclic catalytic process may also be used in reforming LPG, kerosine, or natural gas.

The CCR process and the TPC process of Surface Combustion Company have an advantage over the conventional processes of the Hall regenerative type because the resultant gas is more interchangeable with natural—and these processes have more flexibility with different feedstocks.

Details on the CCR process may be obtained by references to the paper on "New Developments in the UGI Cyclic Catalytic Reforming Process," by C. B. Glover, United Engineers & Constructors, Inc., presented at the AGA meeting in May 1955.

The Gas Operations Research Committee of AGA has several research projects underway for production of natural gas substitutes, including:

Operation of a Cyclic Pressure Oil Gas Plant.

High Pressure Hydrogasification of Residual Oils.

Methanation of Synthesis Gas from Coal.

High Pressure Hydrogenation of Coal.

The U. S. Bureau of Mines is collaborating with the Atomic Energy Commission to examine the possible application of nuclear energy in gasifying coal with steam.

All of the existing processes of manufacturing substitute gas for natural with refinements and operating experience should result in lowering the cost of substitute gas. However, we look to the products of research for ultimate natural gas substitutes.

TABLE 8. Cambridge Gas Company.
20-Year Average Value of "L" per Segment.
Degree Days per Peak Block
(September 1935 to June 1955).

Daily degree Day level	Per D. D. segment value "L"	Per peak block Degree day
20	136.8	1 687
21	129.0	1 550
22	124.5	1 421
23	115.5	1 297
24	110.4	1 181
25	101.3	1 071
26	96.5	970
27	88.5	873
28	84.5	785
29	76.0	701
30	71.8	624

"L" is the number of days per year that use will be made of the plant capacity. A "segment" is that portion of the seasonal gas heating load that would be produced if the daily plant capacity was equal to the gas demand caused by a degree day.

TABLE 9. Example Calculation of Peak Shaving Economics.

1. By use of formula, the value of "L" per DD Segment equals 131. From Table 5, the closest degree day level equal to the value of "L" at 131 is 21 degrees.	
2. Gas Load—base 5000 Mcf/day x 365	1,825,000 Mcf
Heating 6000 DD x 356 Mcf/DD	1,136,000
	3,961,000 Mcf
3. Natural gas daily demand	
Base gas demand	5,000 Mcf
Heating 21 x 356 Mcf/dd	7,476
	12,476
Peak Shaving Plant	
63 DD—21 DD=42 DD x 356	14,952
Total Peak Day Sendout	27,428 Mcf
4. Without Peak Shaving	
Demand 27, 428 x $57.00	$1,563,396
Commodity 3,961,000 Mcf x 31.5¢	1,247,715
	$2,811,111
5. With Peak Shaving	
Natural	
Demand 12, 476 x $57.00	$ 711,132
Commodity 3,409,200 Mcf x 31.5¢	1,073,898
Total Natural	$1,785,030
Oil Gas	
356 Mcf/DD x 1,550 (dd above 21)	
equal 551,800 Mcf x 75¢	413,850
Total All Gas	$2,198,880

Conclusions:

1. There is a definite need of recording and analyzing "operating costs" of present processes of manufacturing substitute gas for natural. Some companies in New England are going about obtaining such costs by a systematic accounting method. With such cost data available analyses may be made and studies undertaken of methods to lower costs so that when such gas is increasingly substituted for natural the price will enable the continuation or even the expansion of markets for gas.
2. Standby plants for substituting for natural gas appear to be of increasing value. The cost of such standby to the ultimate gas consumer is not a particularly heavy burden, and will be of increasing value to the consumer in reduced total cost of gas by peak shaving and otherwise supplementing the supply of natural gas.

Oil producers face the same discovery and development problems as natural gas producers. If gas is to be made from oil, new oil supplies must be available. Thanks to the U. S. Bureau of Mines and the Union Oil Company of California, there is prospect on the horizon of shale oil recovery at a cost competitive with crude oil. The Institute of Gas Technology has made tests for gas making purposes of oil produced from oil shales and has found it comparable with crude oil.

Our largest source of fossil fuel raw material in the U. S. is coal. It might well be that production of synthesis gas from coal and conversion to a natural gas substitute through methanation or direct hydrogenation of coal may be the road to the ultimate substitute gas.

All of the avenues for substitute gas must be explored and cost determinations made by concerted, energetic action on the part of producers, transmission line companies, and gas utilities. If this is done, I am confident that the cost of supplying substitute gas to the millions of gas customers throughout the country will be at price levels not at variance in the future with the piece of the customer's income pie now being used for complete gas service.

Acknowledgment

This article was prepared from a presentation made at a meeting of the American Association of Cost Engineers, at the University of New Hampshire, Durham, New Hampshire, 1957.

* * *

IDEAS AT WORK

IN THE GAS DISTRIBUTION INDUSTRY

YOUR IDEAS ARE WORTH MONEY!

If you have an operating idea or have devised a piece of equipment to do a job easier or cheaper, send it to us with a photo or drawing (we fix up rough sketches)... we will pay $10 for each idea used.

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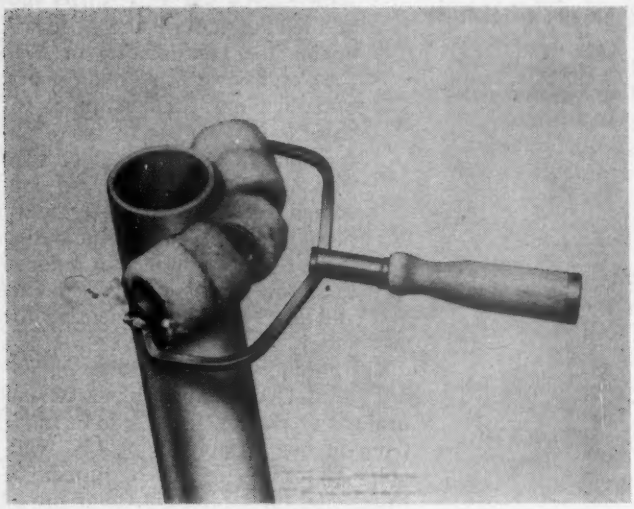

Paint Pipes the Easy Way

If painting pipe, orifice meter runs, small tanks, etc., proves a problem around your distribution facilities, here's a gadget that will make easy work of this tiresome, time-consuming task. It's a paint roller using five small, separate rollers operating on a spring. When slight hand pressure is applied, the rollers fit the curved surface of a pipe, tube, tank, or what-have-you. When released, the roller returns to a straight line shape for easy loading in a paint tray.

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"Golf Cart" for Leak Survey Equipment

Golfers and mailmen aren't the only one's pulling "golf carts" in Concordia, Kansas . . . and this may be the case in a large portion of Kansas if Howard Ward's leak survey cart "catches on."

Ward, a gas service foreman in The Kansas Power and Light Company's Concordia division, built the cart to do away with lugging heavy leakage survey equipment, and equipped it with everything necessary to test for gas leaks.

The leak detector rides in a removable box held in place by a bolt. Boxes, made to fit various types of detectors, can be attached simply and quickly.

Other components of the cart include:

1) Brackets for a "T" bar probe and a "shotgun" or post driver probe.
2) A bracket for holding a soap can.
3) A permanently attached tool box for repairing small leaks (eliminating return trips).
4) A clip board for carrying leakage survey block cards and other records.

Ward built two of the carts . . . both in his home workshop. With the exception of a few nuts and bolts, wheels and a crutch pad for the handle, the carts were welded from materials found "on the scrap pile."

One cart has aluminum wheels from an old lawn mower and the wheels on the other originally adorned a large tricycle. Each cart was built with about $1.50 cash outlay.

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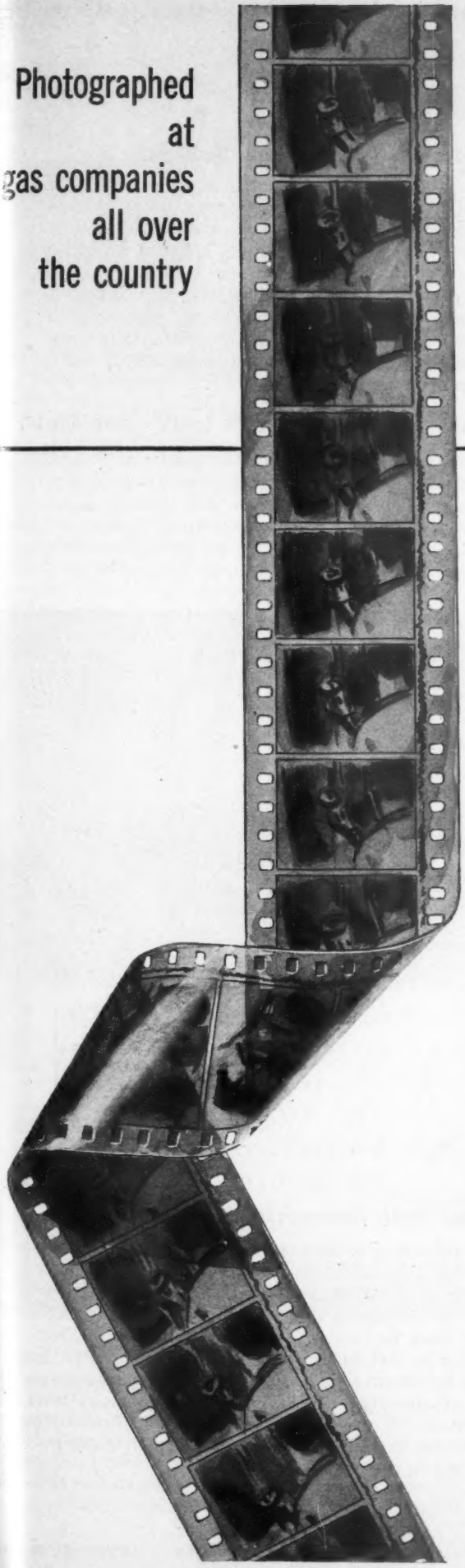
Photographed at gas companies all over the country



"The Last Fifty-Feet"

a 25-minute sound-color movie made for the men who install the final connecting lines which provide safe, dependable gas service all over America.

In this new movie you will see on-the-job sequences of service line installations as practiced by leading gas companies all over the country. You'll see various standard practices for tapping the main . . . making up service lines . . . going through basement walls . . . setting meters and regulators . . . making renewals . . . handling emergency repairs.

In "The Last Fifty Feet," you may discover new ways to save time and money on service line work . . . new answers to problems you are running into. And you'll doubtless want your crews to see it too. So make arrangements now for an early showing at your own office . . . just call your Dresser Sales Engineer, or use the coupon below.

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I'd like to see "The Last Fifty Feet" . . . call me to set up a date

Name_____
Title_____
Company_____
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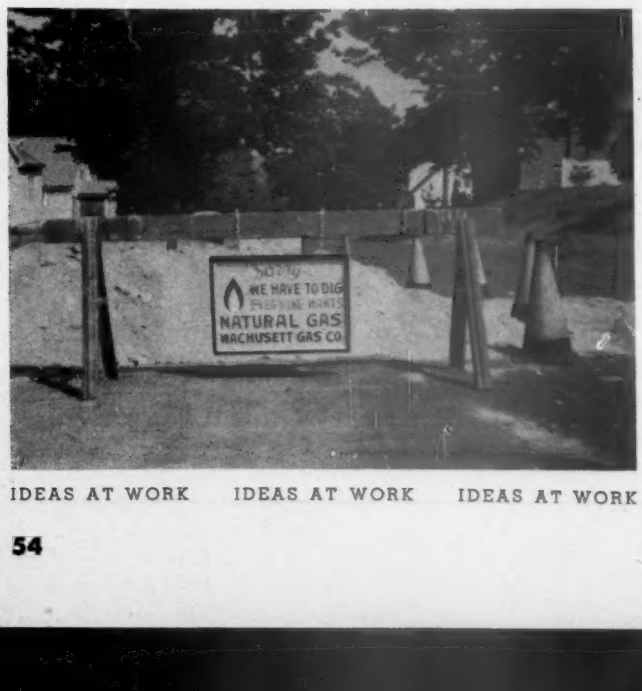
Drum Stacker Eliminates Pallets

Rugged, non-hydraulic, automatic attachment that fits on fork-lift trucks is being used by one utility to speed handling of drums while eliminating use of pallets and saving storage space. The device is easily attached by merely driving the forks into the fork sleeves. A clamp screw secures it in place. The device mechanically grips a drum at rim or chimes so that it can be picked up, eliminating all manual handling. When not in use, it can be stored near the drum storage area. Device can also be used to up-end or head up drums lying horizontally.

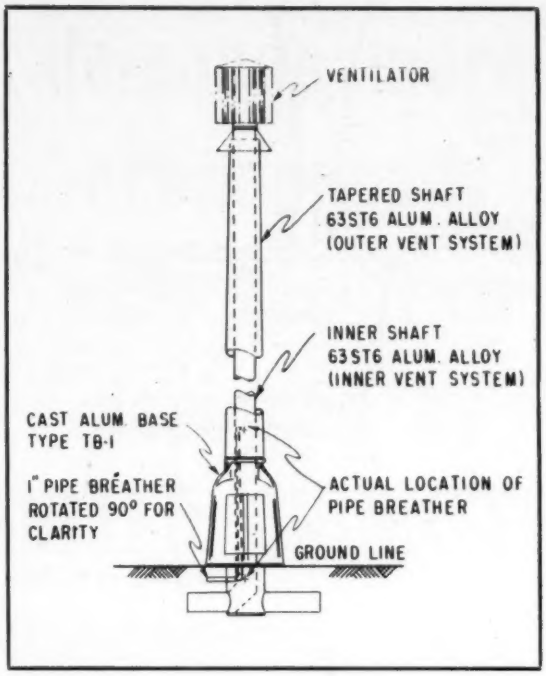
"Night Caps" Protect Unburied Mains

As a precautionary measure against getting dirt and/or small animals and rodents into open mains during the night, easy-to-use "night-caps" can be used to close up the open pipe ends. The device (available commercially) consists of two discs of cast aluminum connected by a screw. Between the discs is a circular, wedge-shaped rubber gasket. When the screw is tightened, the compression on the gasket forces it to seal against the inner surface of the pipe, assuring a tight seal. Discs also are fitted with pipe nipple and plug, and the cap could conceivably be used for low pressure testing, for purging, or similar uses.



Signs Tell Passers-By "Why"

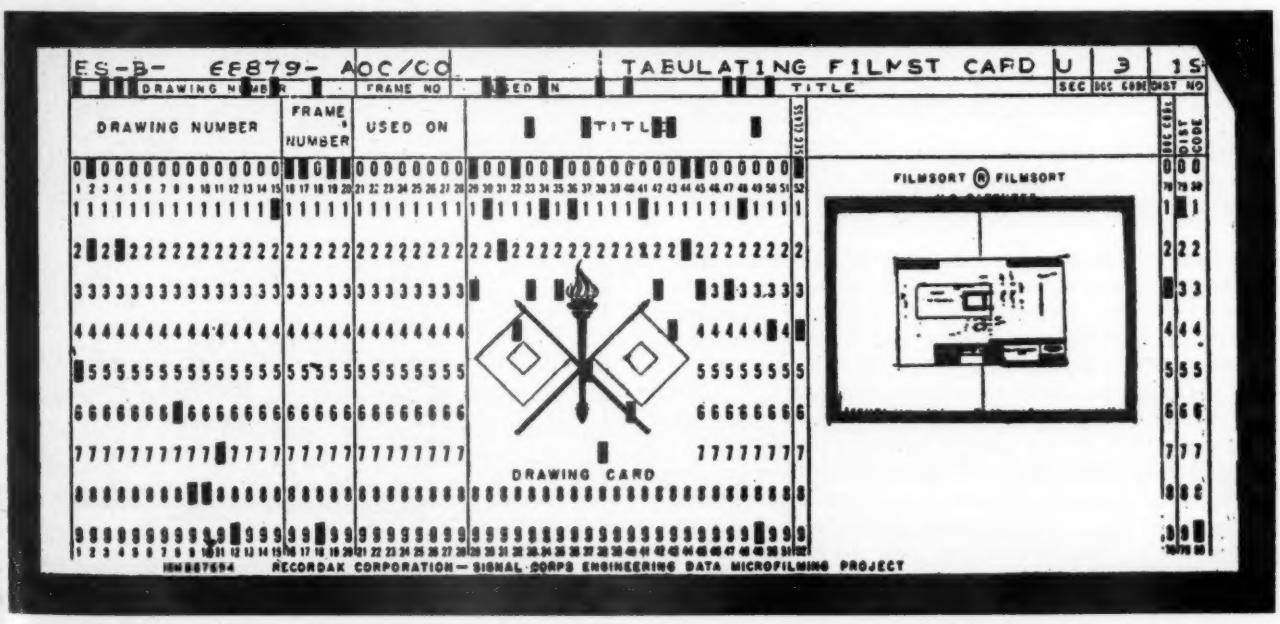
Wachusett Gas Company, Wachusett, Massachusetts, is building good public relations while answering the often unspoken questions of passers-by such as "What's going on here? Who's digging up the street? Why?" by using signs that hang from barricades. The signs, each 30 by 22-in., are painted on both sides, and cost approximately $15. Besides being informative, they keep people aware of progress in the gas industry. The company has received many favorable comments on the signs. Also the signs afford additional protection through greater visibility of barricades to crews working on the street jobs.



Functional Vent Post Also Looks Good

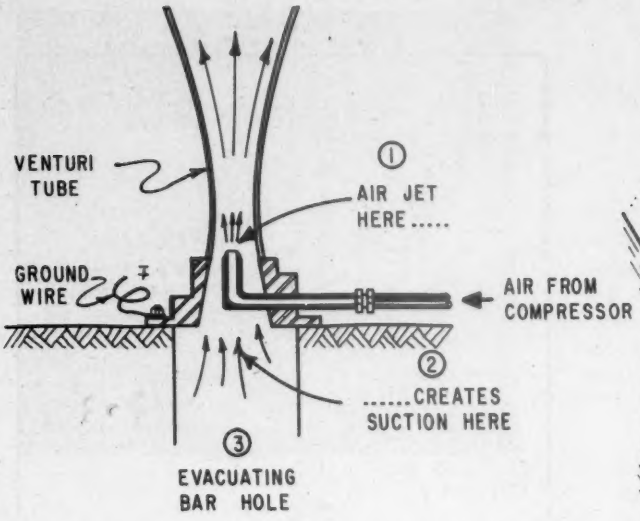
Resembling a lamp post without the lamp, this vent pole is being used by one company to meet both physical and functional standards of local and state agencies in venting underground district regulator vaults. Constructed entirely of aluminum, including the top vent assembly, it is designed in such a manner that rain cannot seep down into the pole. The vent assembly is actuated by air movement.

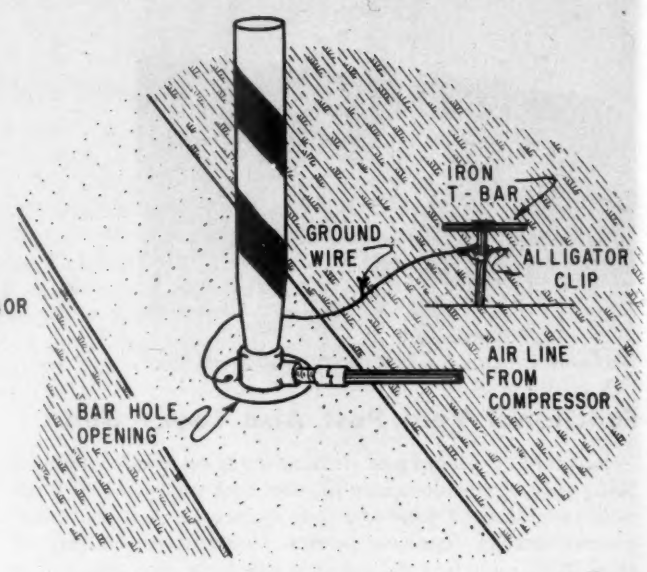
Once an air current passes through the vent, a suction is induced that moves foul air out of the vault and up through the interior shaft. Fresh air in turn enters the vault through the outside shaft, completing the venting cycle. Diaphragm is vented by connecting a ¼-in. copper tube to the 1¼-in. aluminum pipe in the interior shaft. Air intake at top of pole is protected with a cowling that prevents entry of water.



Microfilm "Windows" Streamline Procurement, Cut Filing Costs

Gas utility engineering offices can take a tip from the Army's Signal Corps in reducing costs and increasing efficiency in transmitting engineering drawings. Microfilm "windows" in tabulating cards are made from original microfilm negatives. Cards are distributed to Signal Corps installations through the world for reference in repair and overhaul of equipment and for procurement purposes. They can also be used to make reduced-sized paper prints for issuing bids. New system replaces older, costlier method of making full-size paper reproductions of drawings. It also cuts filing space requirements. Punched cards aid in classification, storage, and location of the microfilms for engineering drawings and records.

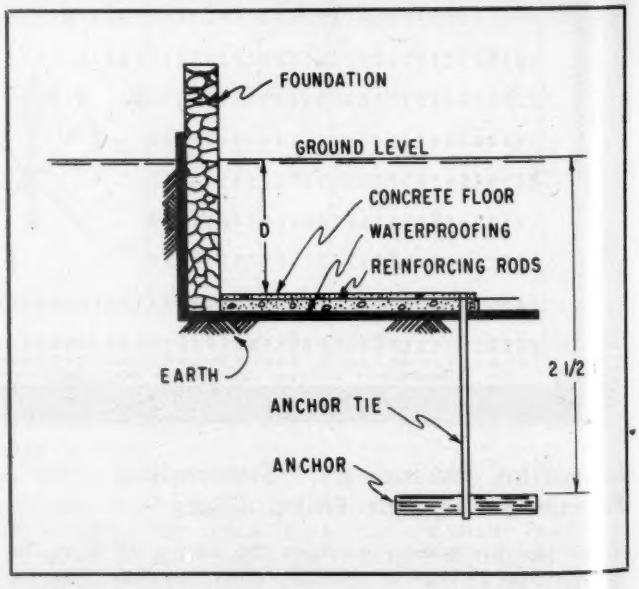




Purging-Ventilating Tool Is Simple Device

Here's a type of air mover that can be a valuable aid in purging or ventilating during construction or maintenance work on a distribution system. The device — which makes good use of the venturi principle — is usually placed over a bar hole. Air from a compressor is supplied through the hose to the inlet jet. Air passing up through the throat causes suction, evacuating the area below the inlet of the large tube.

Waterproofing Underground Regulator or Valve Vaults of Concrete Construction

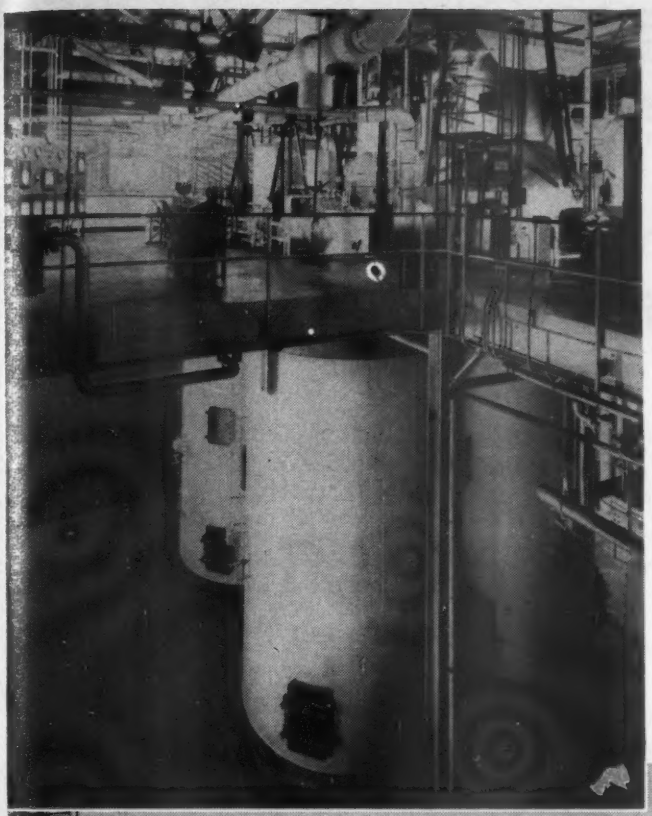


Floor thicknesses can be reduced to a minimum while providing maximum waterproofing with this idea. Contrary to common beliefs, waterproofing is not difficult. Principal essentials are knowing how to do it and doing it carefully. As shown in the accompanying sketch, this method uses an anchor at the correct depth beneath the floor level.

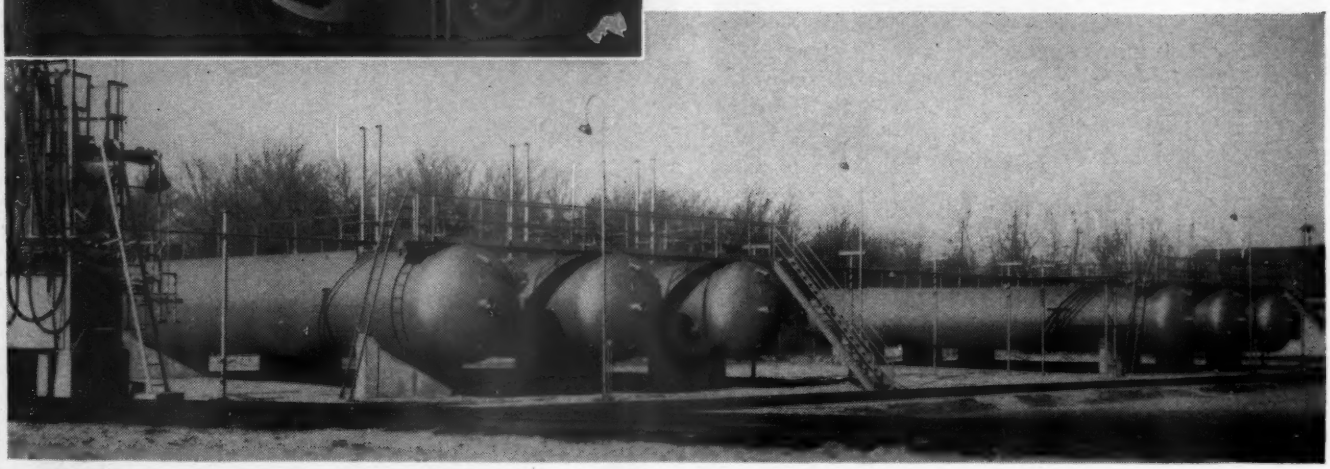
For example, if the depth (D) of the floor is 4-ft beneath ground level, the anchor should be 10 ft below ground level. Simply multiply the cellar floor depth below ground level by 2½ to obtain the anchor depth below ground level.

As indicated, the proper place for reinforcing rods is near the "top" of the concrete floor, not near the bottom. Water pressure from beneath the floor tends to make the floor convex on its top-side, placing the rods in tension. Be sure to tie the anchor to the reinforcing rods.

If the floor area is considerable, use several anchors. Object of the anchor is to add weight of the ground beneath the floor to the weight of the floor itself. To compute this, use a figure of 100 lb per cu ft as weight of the earth and 62.5 lb per cu ft as the weight of water. By placing the anchor or anchors at the distance indicated, correct "balance" is provided.



Meet peak load demands more economically with facilities designed by UNITED ENGINEERS



Comes a sudden temperature drop and peak loads start taxing your gas production equipment to the limit. To keep operating costs down, your facilities must be able to produce gas from the most practical source available.

Why not call in United Engineers and talk your problems over. You may prefer to supplement your present equipment with a dependable L.P. gas plant unit—or high Btu oil gas apparatus. Or perhaps the flexibility and high capacity of a U.G.I. Cyclic Catalytic Reforming (CCR) Process Unit may be exactly what you need. And if gas reserve storage is your problem, our experience and resources are available to help in developing facilities to meet the need.

Our background of 70 years in serving the gas industry can be advantageous to you in planning and installing facilities tailored to your needs. We invite you to share and profit from the skills and know-how that we have accumulated.

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& Constructors Inc

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Our list of clients includes many of the nation's forward-thinking industries and utilities

Here's a matchless GAS range you can SELL

the distinctive new VESTA

It's New!

Equipped with the famous HARPER burners. New THERMAL EYE automatic top burner available on all models.

A GIANT OVEN IN A SPACE-SAVING 30-INCHES!

Center simmer burners . . . Oven Window and Light . . . Built-in Clock . . . Built-in Timer . . . Built-in Lamp . . . Matchless, Automatic Lighting of Oven and Broiler.

MODEL NO. 96-AEF-21

Featuring an Extra-Large Oven!

SPECIFICATIONS

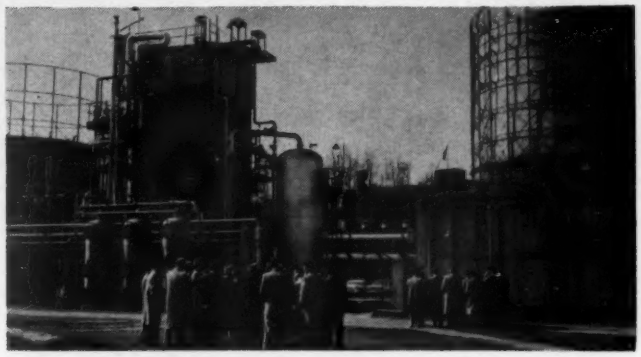
Oven	24" x 19" x 16"
Broiler Drawer	22¼" x 18¼" x 5¾"
Cook Top	30" x 22"
Floor Space	30" x 26½"
Cook Top Height	36"
Overall Height:	
Deluxe Backguard	46⅛"
Approximate Shipping Weight	230 lbs.

Mr. Gas Utility Sales Manager: Now you can sell matchless gas cooking at its best . . . with a thrifty price tag that will appeal to all your customers . . . helping them enjoy ALL of the cooking magic of today's newest matchless gas range . . . the distinctive VESTA!

ATHENS STOVE WORKS, INC.
ATHENS, TENNESSEE

GAS does more costs less!

Eyeing the Innovation — Representatives of refrigeration equipment manufacturers are shown inspecting a unique experimental air conditioning unit at Battelle Memorial Institute, Columbus, Ohio. The experimental 3-ton residential air conditioning unit operates on the so-called "free piston" principle and is powered by natural gas. Unit promises important fuel savings and efficiency in home air conditioning equipment of the future. It is the result of a research and development program, now in its third year, being sponsored at Battelle by the American Gas Association, and based on original studies sponsored by Remington Arms Company.



Eyeing the Reformation. Two hundred industrial gas customers spent a day with Philadelphia Electric Company learning how gas is processed and transported for their ultimate use. Their tour included the West Conshohocken gas plant as well as a special industrial gas equipment exhibit prepared by 13 manufacturers. Shown in the picture is a small group inspecting the gas reformation plant where natural gas is cracked and reduced in Btu value in a Girdler continuous reforming furnace (to the left). Holders in the background store the reformed gas until it is mixed with natural gas for distribution at a 801 Btu value.

AGA Operating Section Conference

Biggest and best conference presented by the AGA Operating Section will take over the Grand Central Station area of New York City on May 5-9 as delegates move into the Roosevelt and Commodore Hotels. More than 2000 are expected for the conferences. The event is the first combined Distribution, Production, and Transmission Conference. Highlight of the week-long meeting will be the Blue Flame Luncheon on Wednesday, May 7, with AGA president Robert W. Otto and AGA managing director Chet Stackpole as guests of honor. Two-dozen valuable door prizes for a drawing at the luncheon have been donated by firms supplying the gas industry.

New Office for East Ohio. Shown is an artist's sketch of the multi-million dollar 21-story East Ohio Building now under construction at Superior Avenue and East 9th Street in downtown Cleveland. As a result of an agreement signed March 27 between The East Ohio Gas Company and the Tishman Realty & Construction Company, Inc., the gas utility will occupy the first eight floors of the new structure. Building is expected to be ready for occupancy by January, 1959.

Appalachian Underground Corrosion Short Course

Laboratory courses are to be added to the 1958 program of the third annual meeting of the Appalachian Underground Corrosion Short Course to be held at the University of West Virginia, June 10 through the 12. These laboratory courses, designed to show practical demonstrations and include student participation, will be offered in addition to the basic and intermediate courses on underground corrosion. Special timely subjects included in this year's course are the progress in the use of epoxy coatings and microbiotic deterioration of engineering materials. Instructor personnel include: W. H. Stewart, president of National Association of Corrosion Engineers who will be the keynote speaker; Dr. Carl G. Deuber; M. C. Miller; William J. Kretschmer; G. C. Cox; Lewis H. West; Charles C. Stoneking; Joseph Schauers, and H. W. Hosford.

Intensive campaign to gain wider gas industry participartion and sponsorship in the national television program is being launched by the American Gas Association. In reporting the new drive, AGA also announced the reorganization of the association's National Gas Industry Television Committee which will now report directly to AGA's PAR committee. The committee is responsible for securing financial support and formulating overall policy in connection with the industry's TV program.

Florence Stove Company Changes Name to Geo. D. Roper Corporation. Stockholders voted recently to change the Florence Stove Company name to Geo. D. Roper Corporation since a major portion of the company's brand-name gas range production will be marketed under the Roper label. Florence merged with the former Rockford, Illinois, gas range manufacturer last October. Production of Florence gas ranges will continue by Florence Range Division of Geo. D. Roper Corporation.

MSA Purchases German Company

Mine Safety Appliances Company of Pittsburgh has purchased a controlling interest in one of Europe's leading manufacturers of safety equipment. The sale, made by Degussa, Frankfurt/Main, to MSA covers the entire manufacturing facilities of Auergesellschaft Aktiengesellschaft (Auer Company, Inc.) located in West Berlin and Schwabisch Gmund. The German company manufactures a complete line of gas masks, carbon monoxide and dust respirators, inhalators, and oxygen breathing apparatus and is one of the oldest producers in Germany of gaslight equipment. The Auer Company was founded in Berlin in 1892 by Dr. Carl Auer von Welsbach, inventor of the Auer incandescent gas mantle. For more than 40 years, Auer's Division of Industrial Safety has been producing equipment for respiratory and body protection. The company also manufactures a line of gas detection and measuring instruments. Ninety percent of the Auer plant was destroyed during World War II. Today the plant is relocated and employs approximately 800 people.

Briggs-Weaver Appointed Schramm Dealer. Schramm, Inc., has appointed Briggs-Weaver Machinery Company as a dealer in the Dallas-Fort Worth area to handle sales, service, and rental of portable and stationary air compressors, the Schramm pneumatractor and pneumatic construction tools.

J. I. Case Company, has formed a separate department to handle sales of its rapidly expanding utility wheel and crawler tractor line. Brought out to supplement the company's larger wheel and crawler units, the new line of smaller machines will be sold and serviced by a broad network of dealers in order to provide the intensive market coverage required. Heading the new utility sales operation is William J. Schlapman, a veteran of 17 years in the construction equipment industry. Assistant sales manager, utility line, is W. H. Vogel, who has a background of 18 years in this field. Until recently both men were associated with Wagner Iron Works.

LEAKAGE REPAIRS

by

SOUTHERN CROSS FORESTERS

Atlanta 6, Ga. MElrose 4-4227

News Notes

AGA Commercial Gas School will be held this year during the week of May 5 at the Edgewater Beach Hotel, in Chicago. The school runs concurrently with the National Restaurant Exposition on Navy Pier where the AGA Industrial and Commercial Gas Section sponsors the giant combined commercial gas exhibit. The school provides basic training and a refresher course for all those who sell or promote commercial gas and commercial gas equipment. During the 5-day course, lectures will cover the types of equipment used for commercial cooking with emphasis on frying, baking, and counter appliances. Controls, air conditioning-ventilation, water heating, steam generation, incineration, selling, cost calculations, service and installation will also be covered by lecturers. One of the highlights of the school will be a display of modern commercial gas equipment surrounding the lecture hall.

Industry Sales and Revenues Reach Record Highs. Gas utility and pipeline industry sales and revenues touched new all-time highs in 1957, exceeding earlier estimates reported in the AGA industry's annual year-end review. Sales soared to a record peak of 75,617 million therms during the 12-months period ending December 31, 1957, representing a 3.8 percent gain over the 1956 figure of 72,846 million therms sold. Revenues from sales to ultimate consumers rang up better than $4 billion for a percentage gain of 6.2 over the previous year. Total operating revenues from sales to ultimate customers and sales for resale reached $6,372 million last year for a 9.0 percent increase over the previous year. Net operating revenues advanced 6.2 percent from $787 million in 1956 to $836 million last year. Net income jumped 6.3 percent to the tune of a record total of $658 million during 1957. Gas utility and pipeline construction expenditures broke ribbons with a new all-time record of $2,010 million for the 12-month period ending December 31, 1957.

Fifth Research Center. Robertshaw-Fulton Controls Company plans to construct a fifth research and development center to seek out advanced automatic control devices for use in the home and industry, and also engage in special developmental work under government contracts. Other R-F research and development establishments are located in Irwin, Pennsylvania; Knoxville, Tennessee; and (two laboratories in) Anaheim, California. New research expansion will involve approximately $950,000 and is to be called the Eastern Research Center. It will be built on a 20-acre site located 14 miles from the center of Philadelphia in the town of King of Prussia.

"YARD WORK" done the easy way . . .

H & M pipe beveling machines mean speed and accuracy on ANY size of pipe!

H&M Pipe Cutting and Beveling Machines offer the easiest, quickest and most efficient solution to preparing pipe for welding, even by untrained operators.

One man can handle and operate any size H&M machine — any of the 7 H&M models handling from 1½" to 36" pipe — after only a few minutes of instruction — and be assured of perfect cuts or bevels every time.

The split-horseshoe gear of H&M machines, plus their extreme lightweight, permits the operator to slip them easily over the next section of pipe and within a matter of minutes the cut or bevel is finished, accurate and true.

H&M TM REG. **PIPE BEVELING MACHINE COMPANY**
311 E. Third St. Diamond 3-0241
TULSA, OKLAHOMA

Northern Indiana Public Service Company engineer checks odorant level in NIPSCO lines with a portable Titrilog. Company keeps odorant level at .9 lb per MMcf — or higher, to be on the safe side. NIPSCO receives its gas already odorized but dumps in additional odorant just to make sure.

"WHERE GAS IS GROWING"...

Distribution Developments

... news about current and planned construction

South Jersey Gas Company, Atlantic City, New Jersey, has underway construction of 15,000 ft of 8 and 12-in. high-pressure line to supply gas to Hercules Powder Company in Gibbstown, New Jersey. Line will also supply natural gas to E. I. duPont's Repauno plant beginning in 1959. Line and meter station work is being done by Henkels and McCoy, contractors. Company also plans 10,000 ft of 6-in. high-pressure loop line in Glassboro, New Jersey, to improve gas supply to fast growing residential area in the Glassboro division. Line to be installed by contractor in early summer. In Atlantic City, company plans 19,000 ft of 6-in. main to supply gas to new housing development to be located on bay at Longport, New Jersey.

Brazos River Gas Company, Mineral Wells, Texas, has completed installation of 41,000 ft of 10-in. high-pressure main in Weatherford, Texas. Contractor for project was Jack Moore Construction Company.

Citizens Gas Company, Hannibal, Missouri, has under construction or planned for 1958 approximately $37,000 in new facilities in its service area. Under construction are 650 ft of 6-in. and 1250 ft of 8-in. low-pressure main; planned are 1200 ft of 2¼-in., 1580 ft of 4-in., and 1900 ft of 6-in. medium pressure mains; nearing completion is 1680 ft of 8-in. high-pressure mains. All work performed by company forces.

Consumers' Gas Company, Toronto, Canada, plans to begin construction in early summer of distribution systems in about 20 Georgian Bay and Ottawa Valley communities of Ontario this summer to provide natural gas service. In an area north and west of Toronto, construction of distribution systems is planned this year for Barrie, Stayner, Collingwood, Thornbury, Meaford, Owen Sound, Victoria Harbour, Midland, and Penetanguishene, with completion date scheduled for August 31. In the eastern Ontario area, systems are planned for Smith's Falls, Perth, Carleton Place, Almonte, Arnprior, Pembroke, Renfrew, Alexandria, Vankleek Hill, and Hawkesbury, with completion date set for November 1.

Fast digging of bellholes — five per hour — is demonstrated by use of hydraulic backhoe at work in Shreveport on Arkansas Louisiana Gas Company mains while distribution personnel look on.

New style service truck, one of two being tested on experimental basis, is examined by Laclede Gas Company personnel. Specially designed compartments open into truck bed, enabling serviceman to work away from street side. Conventional panel-style service truck is shown at left.

Lea County Gas Company, Ysleta, Texas, plans construction in and near Deming, Luna County, New Mexico, of 270,000 ft of 2 and 4-in. main, including 200,000 ft of 2⅜-in. plastic pipe for a distribution system in the Deming farm area to serve irrigation wells. Estimated cost of project is $230,000. Work to be done by contractors.

Haverhill Gas Company, Haverhill, Massachusetts, plans to install on its system in 1958 some 16,460 ft of main, as follows: In Haverhill, approximately 3860 ft of 12-in., 2700 ft of 8-in., and 7400 ft of 6-in., all high pressure; in Amesbury, approximately 900 ft of 6-in. high-pressure mains and 1600 ft of 3-in. intermediate pressure mains. All work is to be contracted.

Municipal Gas Department, City of Henderson, Kentucky, has construction program scheduled for 1958 that includes installation of 20,000 ft of 6-in. high-pressure main, at an estimated cost of $50,000; 5000 ft of 3-in. low-pressure main, and 10,000 ft of 2-in. mains and services, both low and high pressure. All work to be performed by gas department forces.

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H. W. Kizer of Kizer Bros., Ft. Worth, Texas, rents diggers for many different applications. He says, "I wouldn't consider using another digger even if it costs several hundred dollars less."

S. J. Turk, operator of a Sherman for Detroit Edison Co., reports that this unit recently completed in 15 minutes a job that used to take four hours by hand.

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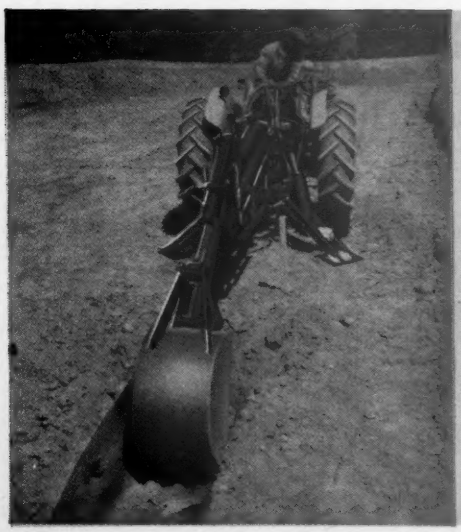

James P. McDonough of the Kevin Co., Baltimore, Maryland building contractors, is completely sold on the economy of the Sherman Power Digger. The Kevin Co. uses the Sherman to dig footings for as many as ten houses a day.

M. T. Witten of Costa Mesa, Cal. says, "I like its ease of handling. But just as important is its speed." He digs 10 x 10 x 6 ft. basements in just 40 minutes.

Distribution Developments

Gas Department, City of Huntsville, Alabama, plans, during 1958, to add approximately 2000 heating customers, to install 50,000 ft of 4-in. high-pressure main and 50,000 ft of 2½-in. medium pressure main; enlarge its city gate metering station, and construct a peak shaving plant. Majority of work other than the peak shaving plant will be done by company forces.

Long Island Lighting Company, Mineola, New York, has budgeted approximately $7,022,000 for its 1958 gas construction program. Included in work to be done is the final phase of job begun in 1956 involving installation of 36,500 ft of 20-in. high-pressure steel main in the Garden City-Hicksville area, with 1958 expense totaling $625,000 of an original $1,295,000. Hallen Company is contractor on the project. Company is also completing work on 71,000 ft of 16-in. high-pressure steel main in the Hicksville-Commack area, with Karlson & Reed, Inc., contracting the work with cost of final phase estimated at $387,000. Company crews are currently constructing a gas compressor installation at Riverhead at a cost of $165,000, with work to be completed by September. Programmed for 1958 construction are 16,600 ft of 8-in. high-pressure gas main in Commack, at an estimated cost of $120,000, and 21,500 ft of 12-in. high-pressure main, in Massapequa, at an estimated cost of $314,000, both jobs to be contracted. During 1958, Long Island Lighting also plans to install 41,400 ft of 8-in. and smaller miscellaneous distribution system reinforcements, at an estimated cost of $375,000, with work to be done by company crews, and 284,000 ft of 8-in. and smaller miscellaneous main extensions, at an estimated cost of $1,352,000, with work to be done by contractor and Long Island crews. At its Glenwood plant, company plans installation of a propane vaporizer, estimated cost of $66,000, and at its Riverhead plant, plans to increase peak shaving capacity by installation of boiler, water supply, and cooling, at estimated cost of $88,000, with work on both projects by company forces. Company also plans installation of telemetering and tone equipment by its gas operations department, during 1958, at an estimated cost of $111,000.

Central Indiana Gas Company, Muncie, Indiana, plans construction expenditures during 1958 of approximately $2,000,000, principally for new main extensions, meters, services, and regulators, and for certain replacements of existing facilities. Included in the 1958 plans is development of underground storage in the Unionport area southeast of Muncie.

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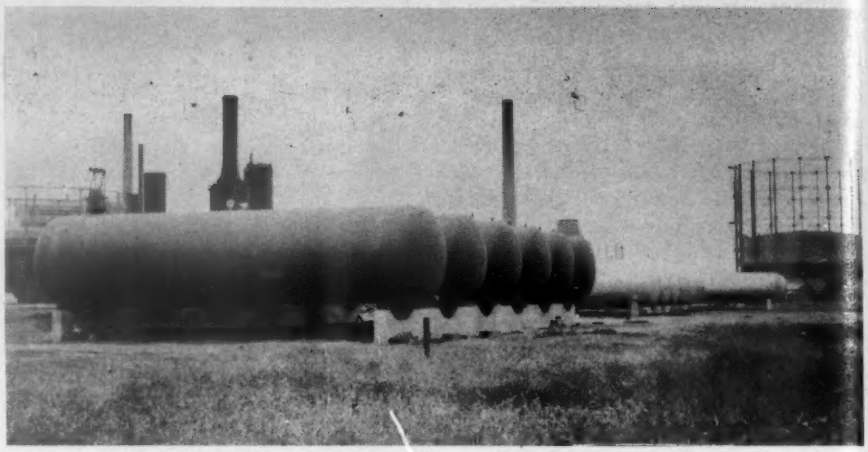


New LPG storage tanks stand ready for painting at the Prospect plant of Citizens Gas & Coke Utility in Indianapolis.

New LPG-Storage Tanks Added in Indianapolis

Increased storage capacity and the addition of a new vaporizer has boosted daily send-out capacity of Citizens Gas & Coke Utility's Prospect Street plant by approximately 5,700,000 cu ft per day.

Addition of 13 tanks to the Prospect plant — 12 of them new and one tank transferred from its former location at the company's Langsdale plant — has increased total storage capacity to 608,000 gal. Each of the new tanks is of 30,000 gal capacity. Previous to their installation the Prospect plant housed ten 30,000 gal tanks and one 18,000 gal tank.

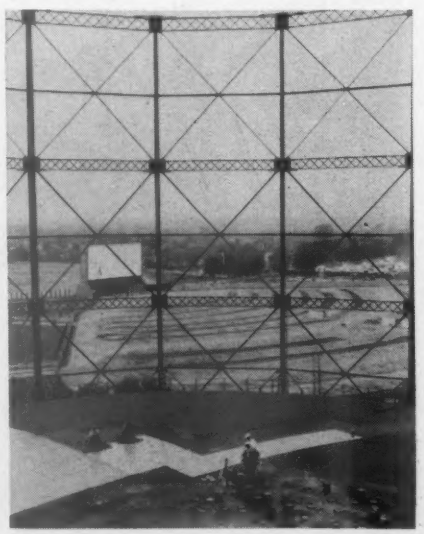
At the Prospect plant, send-out gas is 800 Btu mixed gas. The increased send-out capacity, however, was not accomplished solely by using LPG in LPG-air mixtures; the company also uses LPG to enrich its carbureted water gas (500 Btu) and reformed kerosine (350 Btu) to the 800 Btu mixture for send-out purposes.

Installation of a new vaporizer also added greatly to the send-out capacity, providing an additional 45,000 gal per day vaporizing capacity for an increase from 90,000 gal per day to 135,000 gal per day.

The new facilities and greater send-out capacity will help Citizens Gas & Coke to meet increased peak demands during winter months, as well as provide for maintenance of gas service in emergencies — if the normal supply of natural gas via pipeline should be temporarily cut off.

Along with installation of the new facilities, the plant's holder was given a fresh coat of gasholder gray to complete the alteration of the plant's appearance. The holder is a prominent landmark of the area.

High above the plant, painters apply first coat of gray paint to No. 2 holder at Prospect plant.



Pipe-fitter helper cuts pipe to be used for header line on the 13 new LPG storage tanks.

Distribution Developments

United Fuel Gas Company, Charleston, West Virginia, is nearing completion on a new gas distribution system in Bancroft, West Virginia, that includes 12,162 ft of 2-in., 740 ft of 3-in., and 14,358 ft of 4-in. medium pressure main. Cost of the project estimated at $58,000. Contractor for the job is Saul and McCallister, Inc.

Terre Haute Gas Corporation, Terre Haute, Indiana, has underway a $206,000 construction program for 1958 that includes installation of 60,000 ft of 2-in. intermediate pressure mains and extensions, 7000 ft of 8-in. intermediate pressure main, 2600 ft of 4-in. high-pressure main, and 1300 ft of 6-in. and 700 ft of 10-in. low-pressure replacement mains.

Iowa-Illinois Gas & Electric Company, Davenport, Iowa, plans construction throughout its system in 1958 totaling approximately $3,000,000. Included in construction plans are 184,000 ft of 2-in., 108,000 ft of 3-in., 75,000 ft of 4-in., and 90,000 ft of 6-in., to be laid in the Quad-Cities area. Approximately 90 percent of 6-in. will be in high pressure distribution system; rest of 6-in. and other sizes to be installed in intermediate and low pressure systems. About 60 percent of all work to be contracted; rest will be installed by company crews. In Cedar Rapids, plans call for 23,000 ft of 4-in. and 44,000 ft of 2-in. In addition to major amounts listed, company will install approximately 330,000 ft of ¾-in. service pipe and approximately 100,000 ft of 1¼-in. service pipe.

Northwestern Public Service Company, Huron, South Dakota, plans to begin construction in April and May on several important projects. Included are installation in 15 communities presently served of approximately 273,000 ft of 1¼-in. new and replacement services and 53,300 ft of 2-in., 28,600 ft of 4-in., and 6900 ft of 6-in., all new or replacement intermediate pressure mains. In six new South Dakota communities to be served, construction will include 24,000 ft of 1¼-in. services, 58,500 ft of 2-in., 20,800 ft of 3-in. and 8700 ft of 4-in., all new intermediate pressure mains. In Nebraska, the company plans in three communities presently served the installation of 36,300 ft of 1¼-in. new and replacement services, and 45,500 ft of 2-in., 17,100 ft of 4-in., and 1900 ft of 6-in., all new or replacement intermediate pressure mains. Work in South Dakota will be done by contractors, while company crews will perform construction in Nebraska.

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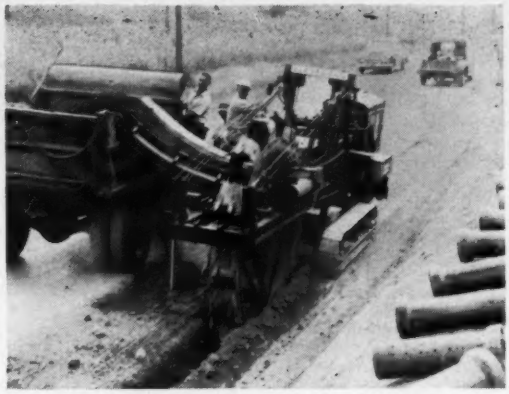

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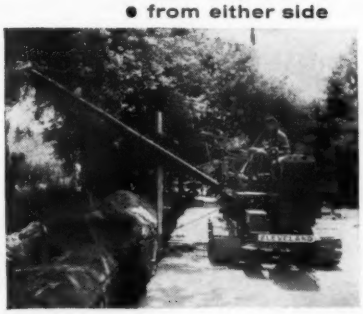

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Distribution Developments

Exterior view, left, of NIG's new Northern Division headquarters in Glenview, Illinois. **New two-way radio system** and pneumatic tube system shown at right, help speed customer service. Customer service tickets travel via tube from receiving desks to radio room. Two-way radio enables company to render more prompt and efficient service to customers. New headquarters also features separate service building, storeroom area, cafeteria, and functional arrangement of operating, service, sales, and administrative offices.

Gas Division of Memphis Light, Gas & Water Division, City of Memphis, Tennessee, plans installation during 1958 of some 360,000 ft of 2, 4, 6, and 8-in. mains as part of its normal expansion and maintenance program on its intermediate and medium high pressure systems. Plans also include 3.5 miles of 12-in. and 4.4 miles of 20-in. high pressure main to provide the city with an additional source of supply. Construction will also be undertaken on 6.9 miles of 16-in. and 8.7 miles of 22-in. extra high pressure main to supply a new electric generating station. Cost of the projects is forecast at $3,148,709. Company crews will perform all of the work.

Louisville Gas & Electric Company, Louisville, Kentucky, plans to install 17,100 ft of 16-in. high pressure main as extension of its city belt line in 1958, with one section of 11,400 ft to begin on June 1, and another section of 5700 ft to start on July 1, completion date of September 1 set for both projects, which will be contracted. Construction of 4800 ft of 16-in. and 5400 ft of 20-in. high pressure belt line as replacement of existing line, with work to be done by contractors, will begin on May 1 and is scheduled for completion by July 1. In the Louisville area, the company plans to install some 300,000 ft of 2 thru 8-in. extensions to its intermediate and low pressure distribution system during the year. Part of the work will be done by company crews and the remainder by contractors.

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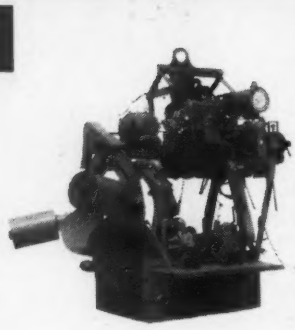

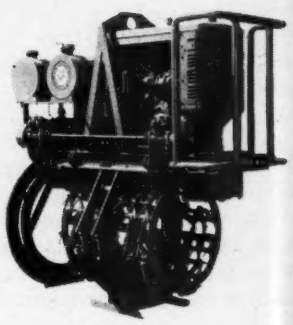

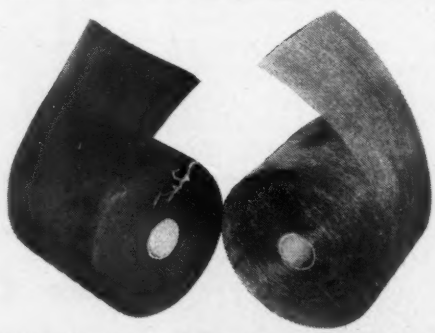

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Davis Backhoe on Work Bull 202 digs flush alongside obstructions, loads directly into trucks.

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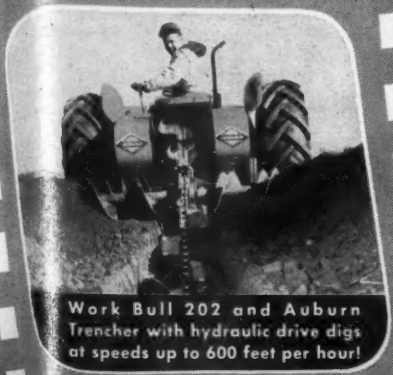

Work Bull 202 and Auburn Trencher with hydraulic drive digs at speeds up to 600 feet per hour!

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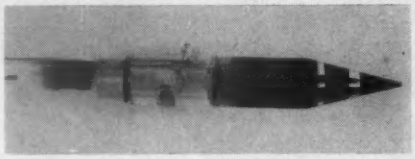
Industrial Equipment. New four-point "power-matched" line of industrial equipment in the light and medium class is now being introduced by Massey-Ferguson. Line includes Work Bull 202 Industrial Tractor; Work Bull 1001 Multi-Purpose Tractor Loader; Work Bull 303 Industrial Tractor and 500 Loader; and the Work Bull Fork lift, plus a variety of auxiliary attachments that are "power matched" to each of the basic units. Work Bull 202 is an industrial tractor, with a high torque, 40 hp engine that develops tremendous lugging ability at slow speeds. The 202 and the Davis Loader have been particularly designed to go together as an integrated unit.

Loader attaches directly to tractor, and the pump drive and mounting are built right in the tractor. The Work Bull 1001 Multi-Purpose Tractor Loader is convertible into eight different machines . . . loader, pick-up street sweeper, backhoe, fork lift, angle dozer, crane, rotary broom, and loader with a scarifier attachment. The Work Bull 303 has a 25 hp engine with instant reversing and power steering, and is designed to fill requirements of the medium-range equipment class. Unit accommodates new 500 Loader which has a variety of different attachments—all interchangeable with the attachments on Work Bull 1001. Both the 1001 and 303 are available in gasoline or diesel models. Fourth unit in the line, the Work Bull Fork Lift is low-cost answer to industrial handyman's need for help in stock piling and clean-up work. Attachments available in Work Bull line include Auburn Trencher, Ram Pick-up Sweeper, scarifier-scraper, post hole digger, multi-purpose rear blade, scoop, cordwood saw, tipping trailer, pipe or cable layer, and wagon chassis. *Massey-Ferguson Industrial Division.*

CIRCLE (1) ON THE REPLY CARD

Base Station Amplifier. Two new base station amplifiers, designed to provide up to 330 watts of power and increase signal transmitted from dispatcher's position in a two-way radio system, have been added to General Electric's new line of high powered communication equipment. Two latest models, for users in low and high band frequencies (25-54 and 144-174 mc), join the 250-watt UHF high-power station announced by General Electric in December. In all three bands, units are engineered to provide increased coverage and improve reception in vehicles traveling at great distances from the transmitter. Units are available for repeater operations and local, extended local, and remote control. *General Electric Company.*

CIRCLE (2) ON THE REPLY CARD



Soil Redox Probe Instrument. Instrument for determining reduction-oxidation (redox) potentials of soils is now available from Deuber Laboratories. Research has shown that this measurement is correlated with corrosiveness of anaerobic soils . . . soils in which sulfate-reducing bacteria occur. Redox probe instrument is designed for field use in soils to pipe depth. Readings are made with sensitive millivolt meter. Degree of soil corrosiveness is indicated whether corroded structures are present or not so instrument is particularly useful in soil surveys. Illustration shows electrode system of basal end of instrument. *Deuber Laboratories.*

CIRCLE (3) ON THE REPLY CARD

Sequence Controller. SIE's new Compressor Start Unit (CSU-1) sequences all yard, compressor, and auxiliary valves automatically. Unit will start and bring

on line a compressor on receipt of single actuating signal permitting highly efficient operation of a compressor station from the control room. Addition of SIE Compressor Station Computer Controller and SIE Telemetering Transceivers provides a modern system approaching full automation. Not only is compressor control achieved through automatic sequencing of valves and solenoids, but unit displays instant indications of measurements and functions. Alarm operation and automatic shutdown occur when safe operating parameters are exceeded, or on failure of proper starting events. *Southwestern Industrial Electronics Co.*

CIRCLE (4) ON THE REPLY CARD

One-Man Trencher. Arps Corporation has developed a new one-man operated trencher, the Trench-Devil, Model Jr. that is ideal for gas or water line trenching and cable installations. One man can transport the Trench-Devil to the job-site easily unload it from a truck, complete the work at hand, and load the unit unaided. Unit digs trench 2¾-in. wide, up to 20-in. deep. At the 20-in. depth, dig-

ging speed averages 6 ft per minute; a 12-in. depth increases digging speed to 15 ft a minute. Features include: Cutters made of high carbon, heat treated steel; ball bearings utilized at all points of high speed or heavy load . . . sealed to keep out dirt; and a protective shroud to shield the operator and engine from flying dirt. Curb attachment for digging inside of concrete curbings is optional equipment useful for municipalities or utilities laying cable just inside the curb line or when digging alongside a hillside. When using this attachment, trencher's wheels are adjustable to 8-in. below normal, keeping unit level at varying curb heights. *Arps Corporation.*

CIRCLE (5) ON THE REPLY CARD

Main Cleaner. A high pressure, portable, three-stage turbine type pneumatic materials handling system, the Main-O-Vac, has been adapted especialy for gas industry cleaning requirements. Unit cleans dust, dirt, rust scale, and other loose foreign materials from mains up to 1000 ft long in less than an hour. Main-O-Vac consists of main machine, together with adapters for 4, 6, 8, 10, 12, and 16-in. mains; three 10 ft flexible intake pipes; and trailer mounted bin collector with bag separator component. Collector bin and bag separator component, trailer mounted, can be towed to the dump site independently of main machine. Hand operated hydraulic dump enables one man to easily unload the collected material. *Dunbar Kapple Inc.*

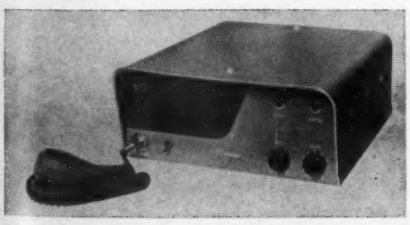
CIRCLE (6) ON THE REPLY CARD

Pressure Bulb Assembly. New improved manometer pressure bulb assembly for field testing of orifice meters, low pressure regulators, and low pressure gages features bleeder valve that allows operator to accurately control the reducing pressure at any selected point simply by opening and closing finger tip control needle valve. Assembly consists of a hand pressure bulb equipped with a small bleeder valve, an expansion reservoir protected by a heavy silk net, and connecting rubber tubing. Handles pressures to 100 in. wc. *W. H. Curtin & Company.*

CIRCLE (7) ON THE REPLY CARD

Front-End Loader. New "Payloader" model, the H-25, is the first rubber-tired, front-end loader with rated carrying capacity of 2500 lb. Although new model has more capacity and is larger and heavier, it has shorter turning radius (6 ft to the outside rear hub) than any other rubber-tired, tractor-shovel. Power-steering as a standard feature assists both maneuverability and ease of handling. Power-shift transmission and torque-converter are matched to provide maximum in speed of movement and ease of operation. Power-shift transmission is full-reversing and has two speeds. Unit is available with choice of gasoline, diesel, or LPG power. Has 44 hp gasoline engine equipped with wet sleeve cylinder liners for easier maintenance. *The Frank G. Hough Company.*

CIRCLE (8) ON THE REPLY CARD



FM Mobile Radiotelephone. Kaar Engineering Corporation has developed a low-priced FM mobile radiotelephone that can be licensed for use by any citizens of the U. S. for communicating between vehicles and fixed points, from one vehicle to another, and between two or more fixed points. Unit operates in the 450-460 megacycle special and safety services and the 460-470 megacycle citizens radio bands. Unit provides reliable communication between vehicles and a fixed point within a 10-mile radius of the fixed station. Ranges of up to 50-200 miles can be obtained between vehicles and from fixed points to vehicles when a repeater station is used. Radiotelephone is available as a complete single package unit, suitable for mounting under the dash of any vehicle or on any flat surface. May be operated directly from a 12-v battery or 117-v a-c. *Kaar Engineering Corporation.*

CIRCLE (9) ON THE REPLY CARD

Gas Refrigerators. First two models of 1958 line of Norco gas refrigerators are now available. Designated the 5865G and 584G, units have approximately 7 and 4 cu ft cold storage space. Available in either white or hammered bronze exterior finish, both models feature new Norcold refrigerating unit. Thermostatically controlled, refrigerators employ fully automatic safety controls as well as "matchless" ignition. The 5865G unit offers an across top freezer with three ice cube trays, full width crisper with glass cover, four shelves, two butter keepers, egg rack, jar rack and bottle stand. The 584G is a table top model with square cabinet and contoured door, three shelves, two ice cube trays, two butter keepers, egg rack, bottle stand, and full width crisper with glass cover. Both refrigerators carry a written warranty and are available for either natural or LPG operation. *Norco, Incorporated.*

CIRCLE (10) ON THE REPLY CARD

S-700-L SYNTHETIC DIAPHRAGMS

for 1-A sprague gas meters

In thick or thin meter cases, new Lancaster S-700-L Synthetic Diaphragms can be centered and adjusted perfectly. The adjustable carrier wire and special center bracket are attached directly to the diaphragm!

Lancaster engineers have developed a new kind of material and a new diaphragm construction that withstand excessive flexing — a 'must' for Sprague or Ironclad meters.

No other material tested approaches the flexibility and low differential of the Lancaster S-700-L Synthetic Diaphragm! It's ready now for your 1-A Sprague Meters.

S-700-L Synthetic Diaphragm comes complete with carrier wire and gasket attached. Can be furnished without gaskets cemented to flange.

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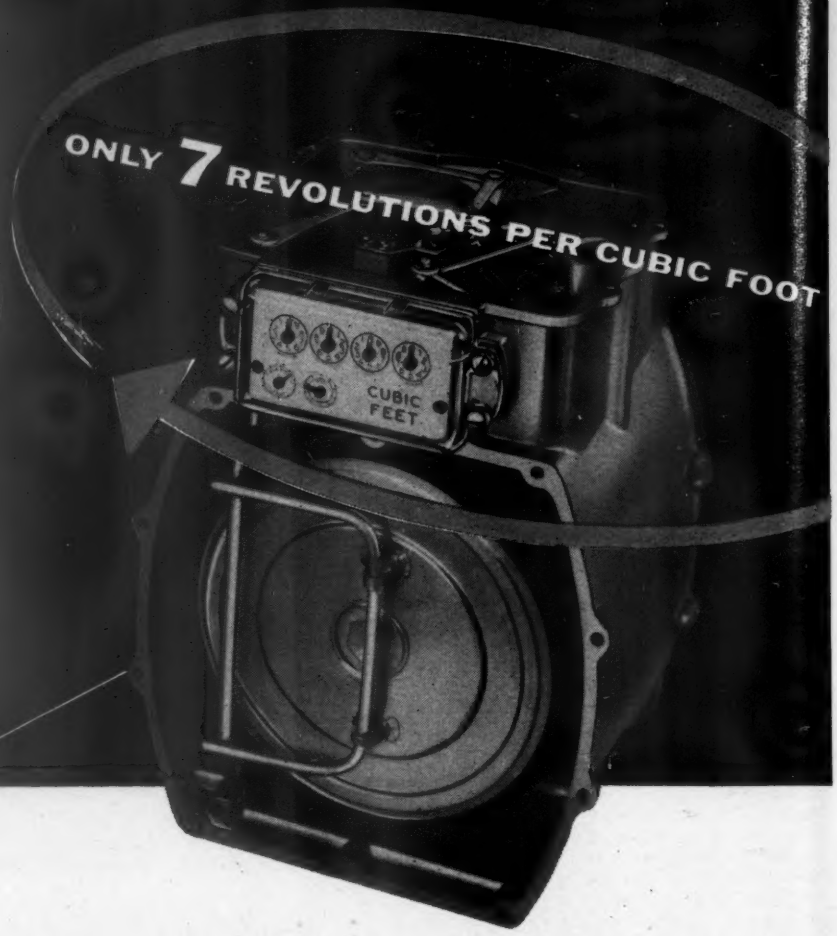
New slow-speed AL-250 ALUMINUMCASE METER... for sustained accuracy



MODEL AL-250 ALUMINUMCASE
Rated capacity 250 cfh of 0.60 sp. gr. gas at ½-inch w.c. differential — psi working pressure.

The new American® AL-250 Aluminumcase Meter operates at only 7 revolutions per cubic foot providing proven tin meter accuracy possibilities through greater power and slow-speed operation.

Every field-proven design feature pioneered by American is incorporated including oil impregnated porous bronze bearings, internal rubber grommet seals ... PLUS

- **AMPLE POWER** — with large, 3-convolution molded Duramic diaphragms for all fuel gas services.
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- **LIGHT WEIGHT** — aluminum alloy pressure die-cast body reduces shipping weight ... easy meter handling and setting.
- **INTERCHANGEABILITY** — aluminum alloy and cast iron tops interchangeable in setting with 5B and 10B Ironcase Meters.
- **DIE CAST METER CONNECTION THREADS** — minimize galling.
- **EASY READING INDEX BOX** — clear, high impact strength molded plastic insures full index visibility.
- **DISTINCTIVE DESIGN** — modern styling insures customer acceptance.

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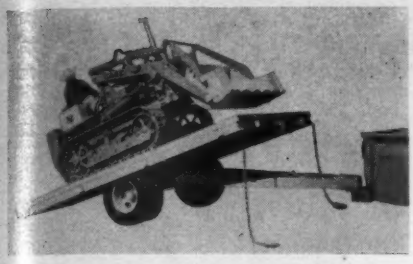
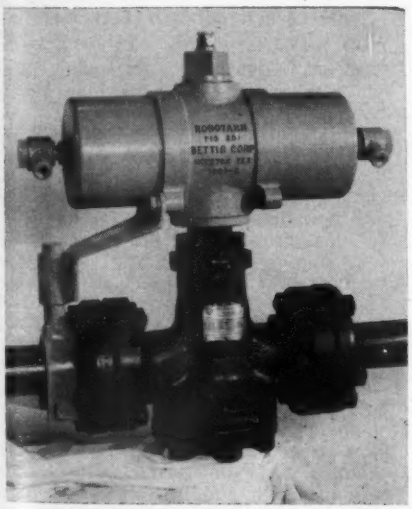


Tilt-Top Tractor Trailer. New flat bed, 5-ton capacity, tilt-top trailer is now offered to purchasers of Case wheel or TerraTrac crawler tractors. Designated Model 90, trailer can be hauled behind any light pick-up truck to move tractor quickly from job to job. One man can hitch trailer and load and unload tractor in less than two minutes. Trailer is equipped with safety brakes. Higher capacity trailers are also available for heavier TerraTrac models. *J. I. Case Company.*

CIRCLE (11) ON THE REPLY CARD

Vise Stand. New modified vise stand, the 8A, has been announced by Toledo Pipe Threading Machine Company. Stand incorporates several design improvements including mounting holes for most of popular-make vises, elastic stop nuts for all fastened elements, new steel tray that prevents folding while in use. Stand has three integral pipe benders, tool slots, a pipe rest, and adjustable bracket for use with ceiling brace. *Toledo Pipe Threading Machine Company.*

CIRCLE (12) ON THE REPLY CARD



Robotarm Valve Actuator. New valve actuator developed by Bettis Corporation features a totally enclosed piston rack and gear assembly fully submerged in an oil bath. The gas or fluid operated actuator for operation of plug valves and other 90 deg rotating mechanisms can be field installed and adapted to the average plug valve stem in a matter of minutes. Valve operation is not disturbed and no special tools are needed. Square shank on top of the shaft of the Robotarm enables the unit to be hand wrench operated when desired. Adjustable stops are provided. Special Robotarm actuators can be furnished for higher torques, gear head valves, direct operation off high line pressures and electro-hydraulic operated units. Standard models generate torque output from 3000 in. lb to 25,000 in. lb with 100 psi operating pressure. *Bettis Corporation.*

CIRCLE (13) ON THE REPLY CARD

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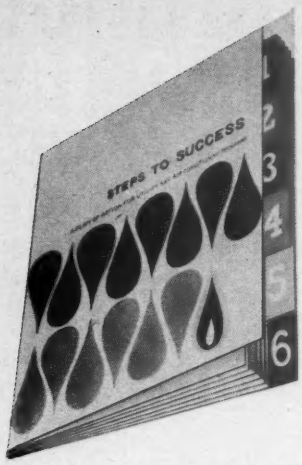
Bulletin Board

NEW BOOKS...BROCHURES...CATALOGS

For more information on items described here in brief, use the handy reply card and circle the corresponding numbers



Air Conditioning Promotion Plans. American Gas Association has announced a new "how-to-do-it" booklet entitled "Steps to Success," that provides utility companies with detailed plans of action for launching and conducting air conditioning programs. The 84-page booklet presents step-by-step plans for companies just beginning air conditioning sales and service programs as well as valuable data for utilities expanding existing problems. Full details on economics of air conditioning, organizational goals, outlines of management policies that have proved successful, and results of varied utility sales and service procedures are given. Newly available statistics on gas air conditioning, including total number of residential, commercial, and industrial gas installations to date and the industry's total sales for 1957 are included. One section offers an up-to-date report on extensive purchases of central air conditioning systems planned by the Armed Forces and General Services Administration of the federal government. *$2.00 each. AGA Promotion Bureau.*

CIRCLE (61) ON THE REPLY CARD

Arc Welding Training Manual. Recently prepared manual, written expressly for hand welders, presents material basic in its approach and deals with each phase of arc welding in language that is simple, direct, and easily understood. Processes are explained and terms defined. Arc welding equipment, identification of metals, and metals and their structure are described. Also, for the first time all AWS electrode classifications have been listed in one publication. *American Welding Society.*

CIRCLE (62) ON THE REPLY CARD

Slide-Rule for Radio Maintenance. Pocket-size "Service Detalizer," a slide-rule condensing information normally found in more than 50 instruction books, has been devised by General Electric's Communication Products Department for servicemen maintaining two-way radio systems. Datalizer provides information on correct tuning, meter types, meter readings which normally occur in transmitter and receiver during tuning, power supply information, and other data on two-way equipment manufactured by G. E. in the past decade. *$1.50. General Electric.*

CIRCLE (63) ON THE REPLY CARD

Engine Specifications Slide Rule. New special type instrument has been produced by Diesel Dials that gives rating and application characteristics of all diesel and natural gas engines manufactured in the United States. Dial indicates all combinations of bhp, bmep, and rpm for every engine listed, can solve complicated engine computation and application problems and provides for corrections in altitude, temperature, and generator efficiencies. *Diesel Dials, Inc.*

CIRCLE (64) ON THE REPLY CARD

Blowers and Gas Pumps. Increased capacity ratings have been announced by Roots-Connersville Blower for its AF Rotary Positive Blowers and type XA Rotary Positive Gas Pumps. New specifications and design data and complete rating tables are presented in 4-page bulletin. Increased capacity ratings have been made possible by design refinements that permit higher operating speeds and result in greater efficiency. *Roots-Connersville Blower, Division of Dresser Industries, Inc.*

CIRCLE (65) ON THE REPLY CARD

Approved Appliances Directory. January, 1958, semi-annual issue of the AGA Laboratories Directory of Approved Appliances and Listed Accessories is now available. Directory lists all gas appliances and accessories in current production that have been tested and approved by the American Gas Association Laboratories. Equipment is arranged according to type and listed under manufacturers' names. Listings are shown for appliances for use with natural, manufactured and mixed gases, liquefied petroleum gases and LP gas-air mixtures. Pertinent information relative to field installation of appliance is also presented. Copies are available with annual subscription ($2.00) that includes two semi-annual issues and 10 monthly supplements. *AGA Laboratories.*

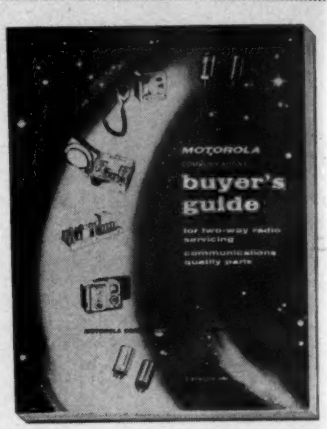
CIRCLE (66) ON THE REPLY CARD

Water Heater Catalog. Ruud Manufacturing Company is now distributing a newly revised catalog that describes firm's complete line of commercial gas water heaters. Seventeen models are presented in AGA Use Approval Classifications. Data on application, construction specifications, controls, hot water deliveries, and space requirements are included. Catalog also contains information on Ruud's equal-flow manifold assembly for multiple-unit installation of Sanimaster gas water heaters. *Ruud Manufacturing Company.*

CIRCLE (67) ON THE REPLY CARD

Lightweight Pipe Coupling. Victaulic Company has prepared a new 6-page two-color illustrated bulletin describing "Vic-Easy" method of quick-coupling lightweight pipe or tubing. Bulletin details installation and operating features, explains how use of lightweight pipe with roll-grooved ends effects substantial savings, and illustrates typical applications. *Victaulic Company of America.*

CIRCLE (68) ON THE REPLY CARD



Two-Way Communications Parts Catalog. Motorola's 1958 edition of its 116-page Communications Buyer's Guide has been considerably enlarged to make it the most complete catalog of two-way communications parts, kits, chassis, test equipment, and accessories available. New sections have been added, covering not only the normally required replacement parts and equipment, but many kits and accessories designed to improve existing communications systems. Catalog is profusely illustrated with photographs, drawings, and diagrams. *Motorola Communications and Electronics, Inc.*

CIRCLE (69) ON THE REPLY CARD

Materials Handling Equipment. Silent Hoist & Crane's new brochure details their various materials handling units for construction and servicing operations. Of particular interest to gas distributors are the Liftruk, Lift-O-Krane, and Krane-Kar units. Heavy duty Liftruk unit comes in sizes ranging from 3- to 30-ton capacity; has front-wheel drive, rear-wheel steer, fluid-drive, and power steering for handling ease and positive control in tight areas. Lift-O-Krane converts Liftruk into a 3-in-1 combination—lift truck, ram truck, and mobile crane. Conversion can be completed in five minute. Krane Kar, a versatile mobile swing-boom, comes in five sizes ranging from 1½ to 12½ ton capacity. Unit has front-wheel drive, rear-wheel steer, and fast responding boom. Gas or diesel powered, Krane Kar is available with solid or pneumatic tires and with variety of attachments including clamshell, snowplow blade, and rotary broom for clearing. *Silent Hoist & Crane Company.*

CIRCLE (70) ON THE REPLY CARD

Combination Welder-Power Supplier Unit. Lincoln Electric has issued a new four-page, two-color bulletin on their portable welder that supplies power, too. The unit, called "Weldanpower," is a combination a-c power supply and a-c arc welder. Controls are mounted on the outside of the welder. Separate windings are provided for welding and power circuits. When necessary both circuits can be used simultaneously without stopping engine or handling high-voltage switches. Specifications, output ratings, and applications for the unit are given in the new bulletin. *The Lincoln Electric Company.*

CIRCLE (71) ON THE REPLY CARD

BOOKSHELF

Control of Non-Manufacturing Costs, *published by the American Management Association, Inc., 1515 Broadway, Times Square, New York 36, New York. Special Report 26. Pages, 142. Price, $2.00.*

Special report shows how selected companies apply imaginative solutions to the problems of higher costs in fiscal, marketing, personnel, and office management areas — how they find new profit opportunities in administrative cost control. Representatives of Lever Brothers Company, Gulf Oil Corporation, Radio Corporation of America, etc., discuss topics such as expense control in a changing business environment, cost of handling and mishandling, and budgeting process.

New Rules for Gas Conversion Burners — American Standard Requirements for Installation of Gas Conversion Burners in Domestic Ranges, *published by American Standards Association, 70 East 45 Street, New York 17, New York. Pages, 39. Price, 25 cents a copy.*

New American Standard tells how to switch to gas safely and effectively. Gives fundamental rules for installing gas conversion burners on home ranges formerly using liquid or solid fuels, including kerosine, oil, coal, or wood. Original Standard on the subject was published in 1951. Latest edition represents 7 years testing of old Standard requirements and incorporates newest developments by the gas industry.

Influence of Port Design and Gas Composition on Flame Characteristics of Atmospheric Burners, *published by American Gas Association Laboratories, 1032 East 62nd Street, Cleveland 3, Ohio. Price, $2.50.*

Research studies of the influence of port design and gas composition of flame characteristics are described in new publication. Bulletin 77 reports research performed at Laboratories under Project DA-1-GU, sponsored as a PAR plan activity by AGA's committee on domestic gas research. New and improved relationships between burner geometry, gas composition, and appliance environment and the conventional flame characteristics of lifting, yellow tipping, and flashback have been developed. Tables and multiplying factors for both drilled port and rectangular or slotted port burners have been developed.

Standards on Screw Threads and Projections. *Sections 3 and 6 of American Drafting Standards Manual. Published by American Society of Mechanical Engineers, and available from American Standards Association, 70 East 45 Street, New York 17, New York. Price, $1.50.*

Two latest sections of the American Drafting Standards Manual have been developed by 23 national organizations including the Department of Defense on ASA's Committee Y14 under the sponsorship of American Society for Engineering Education and the American Society of Mechanical Engineers. Other standards on drafting practices approved by ASA and published by the American Society of Mechanical Engineers are sections 1, "Size and Format"; 2, "Line Conventions, Sectioning and Lettering"; 4, "Pictorial Drawing," and 5, "Dimensioning and Notes."

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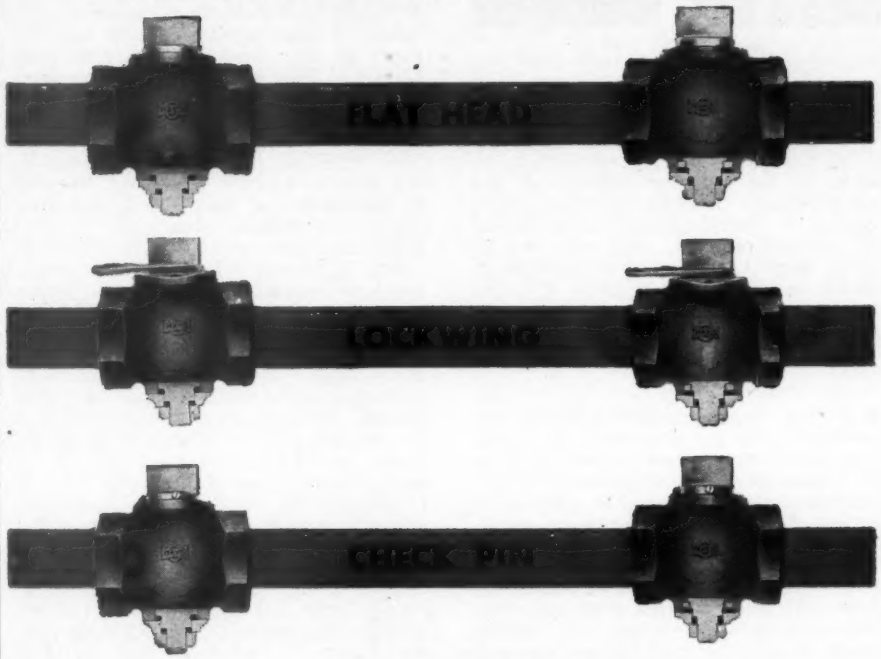

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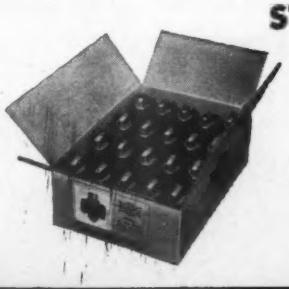

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Men At Work

IN THE GAS DISTRIBUTION INDUSTRY

● Sprague Meter Company has announced the appointment of **Theodore A. St. Clair** as chief engineer and **Thomas J. Watt** as eastern regional manager. Until recently St. Clair has been associated with Bastian-Blessing Company of Chicago as assistant chief engineer.

T. A. St. Clair

C. G. Miller

● **Clare G. Miller** has been appointed president and **T. J. (John) Behrenfeld** vice president of M. J. Crose Manufacturing Company, Inc. The announcement, made by the board of directors of the internationally known firm, was occasioned by the resignation of president **D. Michael Curran,** who will remain active with the company as consultant. Miller has been vice president of Crose for the past three years. Behrenfeld joined Crose nine years ago and has been sales manager for the past two years.

● Recent organization changes announced in the gas department of Public Service Electric & Gas Company include: **H. Whitcomb Nicolson,** general superintendent of gas distribution to assistant to the vice president in charge of gas operation. **Charles R. Dewhurst,** industrial relations manager to general superintendent of gas distribution. **Carroll D. James,** assistant industrial relations manager to industrial relations manager. **L. Martin Harris,** distribution staff engineer to manager of methods.

● **Philip E. Casper** and **Philip E. Arnold** have been appointed as assistant vice presidents of sales for Milwaukee Gas Light Company. Both will report directly to **Bruce A. McCandless,** vice president of sales.

● Directors of J. I. Case Company have elected **T. A. Haller,** vice president in charge of engineering, a newly created position. He will head the new research and development center in Racine, and will have overall supervision of engineering for both the agricultural and industrial divisions.

● Ottawa Steel Division, Young Spring & Wire Corporation has announced a revision of sales territories, and appointment of four new regional managers. **Gerald F. FitzGerald** has been appointed to head sales in New England and Eastern Canada. **Robert H. Loose,** who represented Ottawa for the past year in New England, has been transferred to the Middle Atlantic area, and **Norman L. McArthur** has been transferred from the Middle Atlantic area to the Central States territory, with headquarters in Tulsa, Oklahoma. **Charles W. Sanders** is the new regional manager in the North Central States, Manitoba and Western Ontario, with headquarters in Minneapolis. **Paul L. Ratliff** has transferred from this territory to the southern territory consisting of Kentucky, Tennessee, Mississippi, Alabama, Eastern Louisiana, and the western arm of Florida. **William D. Lyon** has joined the Ottawa staff as regional manager in Texas and Western Louisiana with headquarters in Dallas. **John D. Henley,** former manager of the south central territory, has been transferred to the States of Illinois, Upper Michigan, and eastern portions of Wisconsin, Iowa, and Missouri. **A. R. Phillips** has been appointed regional manager for the States of Colorado, New Mexico, Utah, and Southern Wyoming.

● Arkansas Louisiana Gas Company has announced that **Joe C. Hardin,** member of the ALG board since 1955 and a vice president since 1956, has begun a full-time public relations assignment for the company.

● **L. L. Gowan,** vice president of engineering for Honolulu Gas Company, has been elected a member of the board of directors of the company.

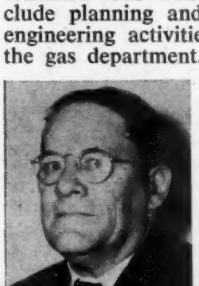
L. L. Gowan

H. T. Libby

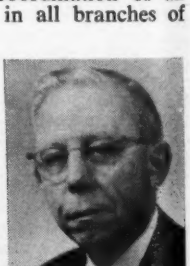
● **Hugh T. Libby,** British Columbia Electric gas distribution manager for the Greater Vancouver area since 1956, has been promoted to a newly-created post, manager of gas engineering and development. Succeeding him as gas distribution manager is **D. W. Minion,** who joined the company in March, 1956, and coordinated the company's conversion to natural gas.

● **E. N. Avegno,** general sales manager, has been appointed executive assistant of New Orleans Public Service Inc. **Charles J. Sinnott** succeeds Avegno as general sales manager.

● **George H. Coon** has been appointed chief engineer of the Elizabethtown Consolidated Gas Company. His duties include planning and coordination of all engineering activities in all branches of the gas department.



G. H. Coon



A. V. Brashear

● **Alvan V. Brashear** has been elected a vice president and manager of operations of Michigan Consolidated Gas Company. He held the post of manager of operations since November, 1957.

● **J. D. Roberts,** vice president in charge of distribution for Mountain Fuel Supply Company, has retired as vice president but will remain as director of the company. He plans to continue his residence in Salt Lake City during his retirement.

E. A. Peyser

Ethan Allen Peyser, Seattle, director of Washington Natural Gas Company, and former president of Washington Gas & Electric Company, died February 1 at his home. He was 60. Peyser became president of Washington Gas & Electric Company in 1950, and served in that capacity until 1955 when the company merged with Seattle Gas Company to form Washington Natural Gas Company.

To your 50th* . . . From our 62nd†

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● **Howard E. Ford** has been elected vice president of Northern Illinois Gas Company. Formerly assistant to the president of Northern Illinois Gas and vice president of NI-Gas Supply, Inc., Ford will continue his present duties in the latter, a subsidiary of the parent company. In his new position, Ford will be responsible for planning and procurement of the company's over-all gas supply requirements. Also announced was the appointment of four employees to assistant vice presidents of the utility, a newly-created position. Heading company activities shown in parentheses, they are: **Loren W. Tuttle** (operation); **Charles F. Hennes** (divisions); **Orville E. Fry** (industrial relations); and **Randall A. Lightbody** (management administration).

● **J. Dean Worthington** has been appointed chief civil engineer of Pacific Gas and Electric Company to succeed **Carl W. Appleford,** who has retired after 38 years of service with the company.

● **R. F. Fred Klein** has been appointed manager of lubricated plug valve sales for Walworth Company. He was formerly sales engineer in the company's Metropolitan Division specializing in sales to the gas distribution industry.

● **Peter J. Monaghan** has been elected to the board of directors of Michigan Consolidated Gas Company. One of Detroit's leading attorneys, Monaghan is senior partner in the law firm of Monaghan & Monaghan & Crawmer.

● Three staff changes made recently at Portland Gas & Coke Company are: **E. D. Rowan,** senior staff engineer, to organize and manage a central staff group to assist all operating departments in technical planning and control problems; **W. J. Mayfield,** director of industrial relations, to supervise all district operations; **D. E. Farmer,** manager of customers service to also manage the customers office.

● **Richard B. Barger,** formerly eastern regional executive of The General Controls Company of Glendale, California, has rejoined The Hartford Gas Company as heating and air conditioning sales manager, a newly created post. He will have overall direction of all heating and air conditioning sales and engineering activities of the company.

● **Harold B. Cornwell,** former Athens district special representative, has been promoted to assistant district manager for Ohio Fuel Gas Company.

● Laclede Gas Company has announced the following appointments: **W. H. Hawkins** has been appointed supervisor of claims, succeeding **R. H. Hatton,** who has retired, and **Charles Hartwein** has been appointed manager of the newly created air conditioning division of Laclede's sales department.

● **Charles L. Yost** has relinquished his duties as general sales manager of The Peoples Natural Gas Company to assume new responsibilities as industrial development manager. Succeeding him is **Richard L. Leusch** who was formerly assistant sales manager of The East Ohio Gas Company, Cleveland, Ohio.

● **Elis Petersen** has been named superintendent of purchasing, a newly-created post, for North Shore Gas Company of Waukegan, Illinois.

● **Robert H. Schifferdecker** has been promoted to senior industrial sales engineer in the industrial sales department of The Peoples Gas Light and Coke Company.

● **H. F. Jacobsmeyer,** district sales manager, has been appointed sales manager of Grayson Controls Division, Robertshaw-Fulton Controls Company, succeeding **A. W. Beck** who was recently named marketing vice president.

"As a matter of fact I have had experience as a gas man . . . worked in a filling station once."

● **F. Irving Yewman** has been appointed general sales manager of Lakeland Natural Gas Limited. He will be in charge of all business development activities of the company including sales, advertising, dealer relations, industrial development, and public relations.

● **Don Parsons,** formerly assistant superintendent of customer service for Lone Star Gas Company has been appointed superintendent succeeding **Don Farmer** who was recently promoted to manager of both customer service and customers office. **Paul Lancefield** continues as superintendent of the customers office.

● **Edgar I. Crowley** and **John R. Weinert** have joined the research and development department of Pittsburgh Coke & Chemical Company. Crowley joins the department's engineering development section as a senior chemical engineer; Weinert will be a senior chemist in the protective coatings section.

● **P. L. Chabre** has been elected vice president, sales and marketing of Utility Appliance Corp. and Mission Appliance Corp., water heater subsidiary of Utility.

● **Avery Mays** of Dallas, general contractor and developer of real estate projects, has been elected to the board of directors of Lone Star Gas Company.

● **A. B. Aycock** has been named plant superintendent for Southern Pipe Coating Company. He will be in charge of all pipe coating and wrapping work done at the company's 17 acre plant in Doraville near Atlanta. He was formerly superintendent of production at Mayes Brothers, Inc., Houston.

● **E. R. Torgler,** former works manager, has been promoted to director of manufacturing for Dresser Manufacturing Division and its subsidiaries. Coincident with Torgler's promotion, **J. R. Harrahill,** assistant to the general manager for manufacturing and engineering, has been appointed acting works manager.

● Brooklyn Union Gas Company has announced the following promotions: **Charles L. Neumeyer** to manager of the rate department; **Luke P. Mulvihill** to assistant district manager of the commercial offices in Queens, and **Alfred W. Van Dusen** to supervisor on the manager's staff.

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